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BIG HORN COUNTY ACCIDENT STUDY

AND IMPROVEMENT PLAN

Prepared For:

MONTANA ASSOCIATION OF COUNTIES

In Cooperation With

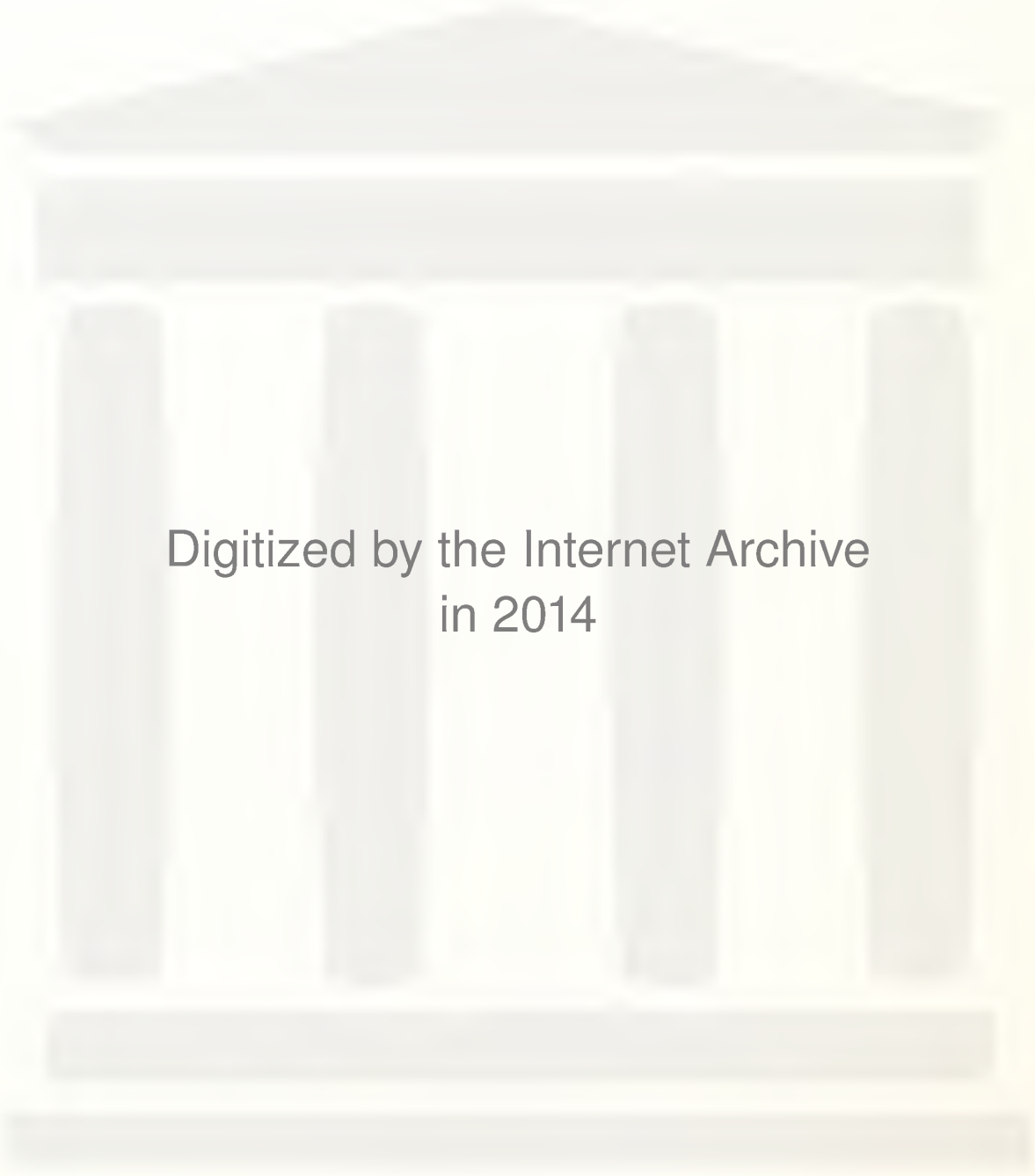
MONTANA DEPARTMENT OF JUSTICE,
HIGHWAY TRAFFIC SAFETY DIVISION

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Prepared By:

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February, 1984


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CHAPTER I

INTRODUCTION

A. Purpose

The purpose of this report is to analyze the cause of accidents at locations on the county road system where accident reports indicate a cluster of accidents, and to develop an improvement plan for those locations.

B. County Road Accident History

For purposes of this study, roads in Big Horn County are grouped in two categories: 1) on-system roads which are part of the federal and highway system which comes under the jurisdiction of the Montana Department of Highways, and 2) off-system roads which are under the jurisdiction of other than the Montana Department of Highways. In Big Horn County, these include roads under the jurisdiction of Big Horn County and the Bureau of Indian Affairs. This study covers roads in category 2.

The Big Horn County road system has 1,526 miles of road, of which 1,247 miles are dirt or gravel surfaced and 279 miles are paved. The average road mileage for the 56 counties in the state is 1,219 miles with an average of 1,105 miles per county dirt or gravel surfaced and 114 miles paved.

During the four-year period from January 1979 through December 1982, 132 reported accidents occurred on the Big Horn County road system.

Accident rates are normally expressed in terms of number of vehicle miles traveled, generally the rate indicates the number of accidents per million vehicle miles of travel over a particular roadway. There are

not sufficient traffic counts available on the county road system to estimate vehicle miles of travel, however, a comparison has been made of the number of accidents per capita and the number of accidents per mile of road. Compared to other counties in the state, Big Horn County ranks 44th in accidents per capita based on the 1980 county population and 37th in accidents per mile of county road.

Table 1 shows the total annual accidents on the county road system and the annual number of accidents on county roads statewide.

Table 2 shows a comparison of accidents per capita and accidents per mile of county road for Big Horn County and the adjacent counties.

Big Horn County has 25 percent more county road mileage than the average county in the state. It also has nearly two and one-half times as much paved county road as the state average. This difference is due primarily to the Bureau of Indian Affairs paved roads. Compared to the statewide average, Big Horn County has 33 percent fewer per capita and less than half as many accidents per road mile on the county road system. Compared to the five adjacent counties, Big Horn County has the lowest number of accidents per capita and the third lowest number of accidents per road mile.

C. County Accident Locations

The Department of Justice maintains computer records of all reported accidents in the state. These are plotted on county maps, annually. The Highway Traffic Safety Division of the Department of Justice has carried out a number of projects where improvements were recommended at locations showing a concentration of accidents. The short-term improvements have been found to be effective in reducing accidents at specific locations. In 1979, Gallatin County implemented recommended short-term improvements at 19 high accident locations. The result was a reduction from an average of 16 accidents per year in 1979

TABLE 1

BIG HORN COUNTY VS. MONTANA COUNTY ROAD SYSTEM ACCIDENT COMPARISON, 1979-1982

	County	Percent of State	Montana
Population	11,096	1.4%	786,690
County Road Mileage	1,526	2.2%	68,240
Total Accidents on County Roads	137	1.1%	12,466
Annual Property Damage and Injury Accidents			
1979	31	0.9%	3,374
1980	33	1.1%	3,129
1981	34	1.1%	3,085
1982	34	1.2%	2,740
Total	132	1.1%	12,328
Fatal Accidents, 1979-1982	5	3.6%	138
Accidents Per Capita	.012	*	.016
Accidents Per Road Mile	.087	*	.183

* Not Applicable

TABLE 2

COMPARISON OF BIG HORN COUNTY ACCIDENTS TO
ADJACENT COUNTIES, 1979-1982

	Statewide Rank	
County	Accidents/Capita	Accidents/Road Mile
BIG HORN	44th	28th
Yellowstone	29th	2nd
Carbon	12th	14th
Rosebud	6th	16th
Treasure	5th	32nd
Power River	7th	36th

to an average of six accidents at each site in 1980. The total cost of the engineering analysis and improvements was $22,000. Based on an average estimated cost of $6,800 per accident and a five-year life for the improvements, the resulting users savings was $15 for every $1 of safety improvement funds expended.

Eight locations in Big Horn County were found to have clusters of reported accidents that would warrant a detailed investigation. Seven of the sites are located on roads that are under Bureau of Indian Affairs jurisdiction and one, the railroad trestle on Sarpy Creek Road is under the county's jurisdiction.

The sites selected for analysis are described below.

Site Number	Location
1	Intersection of Old Highway 87 and Cemetery Road, west of Hardin
2	Sarpy Creek Road at Burlington Northern Railroad crossing
3	Intersection of Indian Service Road 8 and Indian Service Road 5, west of Pryor
4	Curve on Indian Service Road, approximately 4.0 miles west of Crow Agency
5	Crow Agency -- curve on Indian Service Road 1 at intersection of Industrial Park access road
6	Crow Agency -- intersection of Makawasha Avenue and Bala Street
7	East Frontage Road north of Montana Highway 212 at Sun Lodge Motel
8	Intersection of Montana Highway 212 and west Frontage Road near Little Horn Camp and Trailer Park

The locations are shown on the Site Location Map at the beginning of Chapter IV.

CHAPTER II

STUDY METHODS

The determination of improvements required to reduce accidents at the selected sites involves eight basic steps. These are outlined in the following sections.

A. Accident Analysis

Department of Justice microfilm records were used to obtain the accident reports of accidents at each of the selected sites. The accident reports were reviewed and pertinent information was plotted on a preliminary sketch of each location. This information included: a symbolic sketch showing vehicle paths, point of collision, collision type, time of day, road condition and number of injuries or fatalities. The sketches were used to determine trends and patterns.

B. Preliminary Field Survey

The Highway Traffic Safety Division, Traffic Engineer, and the consultant visited each site to determine the specific area to be covered by the detailed field survey. The Valley County road superintendent was also contacted and the characteristics of each site including planning improvements were reviewed. Each site was photographed and general characteristics were noted.

C. Detailed Field Survey

A two-man survey crew revisited each site to collect detailed data. The following information was collected;

1. Site Survey -- Each site was surveyed so that an accurate plan of the site could be prepared, showing roadway alignment, grades, superelevations and other physical characteristics. Surrounding topography was also surveyed showing sign and

other traffic control device locations, fences, utility poles, trees and other roadside objects. The survey was extended to take in all features which could have an effect on the road-user such as background roads that appear to be an extension of the roadway or utility lines or waterways which continue straight while the roadway turns. These features sometimes create driver expectancy resulting in off-road accidents.

2. Traffic Counts -- All available count data for each site was obtained from the Montana Department of Highways. In locations where counts were not available, peak hour counts were made and were used to estimate average daily traffic. Some sites are subject to extreme seasonal traffic variations. At these sites, housing counts along with other land uses were used to estimate average daily traffic.[1]

3. Sight Distance -- The driver sight distance on all approaches at each site was measured.

4. Safe Speed Study -- A ball-bank indicator was used to determine the safe speed on horizontal curves. This instrument measures the overturning force on a vehicle and limits at which riding discomfort and loss of vehicle control begin.

5. Driver Expectancy and Information System Evaluation -- Each member of the survey crew independently rated the driver expectancy and informational system of each site.

 The driver expectancy rating is a measure of a driver's perception of the roadway and the amount of time a driver has to react and take the necessary actions to pass safely through the location. The rating ranges from no unexpected or unusual actions required to very unusual situations which would surprise many unfamiliar drivers.

 The information system evaluation consisted of determining if the roadway and traffic control devices were sufficient to give the driver the information required in sufficient time to take the necessary actions to safely negotiate the location. Ratings for the information system range from easy and obvious information interpretation to the lack of important information.

 The evaluation forms used for the driver expectancy and information system evaluation are shown in Figures 1 and 2.

[1] ADT

Figure 1

DRIVER EXPECTANCY PROBLEMS RATING FORM

Ratings

0 -- Nothing expected or unusual at this location.
Actions required (if any) entirely consistent with driving strategy on approach.
Standard geometry, with pathway(s) for intended movement(s) clearly evident.
No interferences by other traffic likely.

1 --

2 --

3 -- Situation somewhat unexpected.
Driver must be alert, but should be able to respond adequately at "last minute" to most combinations or adverse circumstances.
Some initial confusion on intended path(s) or movements(s).
Interference from other traffic may create some degree of confusion or uncertainty for average driver.

4 --

5 --

6 -- Very unusual situation; will "surprise" many unfamiliar drivers.
Driver required to make major change in driving tactics from those employed over past few miles.
At least a "near accident" almost expected if driver is even moderately inattentive; evasive actions likely to be required.
Intended pathway(s) confusing under fairly normal traffic or lighting conditions.
Other traffic, or lack of it, aggravates situation and misleads driver or deprives him of important cues.

Approach

	Rating						
	0	1	2	3	4	5	6
A	x	x	x	x	x	x	x
B	x	x	x	x	x	x	x
C	x	x	x	x	x	x	x
D	x	x	x	x	x	x	x

Source: Identification of Hazardous Locations, Report No. FHWA-RD-77-83

Figure 2

INFORMATION SYSTEM DEFICIENCIES RATING FORM

Ratings

0 -- Information for required decisions complete and ambiguous.
Signs, markings, delineation in good repair, clean, highly visible.
"Positive guidance" leads driver to appropriate path; makes error difficult.
Approach speeds of most drivers are appropriate.
Light decision load; easy, and obvious.

1 --

2 --

3 -- Some information lacking or somewhat misleading.
Signs should be moved or augmented for better visibility or to provide more decision time.
Visibility of signs, markings, and delineation barely adequate.
Advisory speed information should be changed slightly, or added.
Medium decision load; average driver will be able to handle situation, but may be a little uncomfortable.

4 --

5 --

6 -- Important information missing.
Complete new "information system" needed -- design and installation.
Present signs and markings in very poor condition; need replacement.
Speed limit and/or advisory speed needed; either missing or totally inappropriate at present.
"Positive guidance" on appropriate path lacking; a clutter of negative delineation only.
Heavy decision load; complete attention of average driver required; a "tense" situation at best.

Approach

	Rating						
	0	1	2	3	4	5	6
A	x	x	x	x	x	x	x
B	x	x	x	x	x	x	x
C	x	x	x	x	x	x	x
D	x	x	x	x	x	x	x

Source: Identification of Hazardous Locations, Report No. FHWA-RD-77-83

6. Site Sketches -- The field survey data was used to prepare a sketch of each site showing the pertinent features. These include alignment, grade, roadway dimensions, approaches, ditches, foliage, roadside objects, traffic control devices, surface type and condition, sight distance and surrounding features that may affect the function of the roadway. The sketches have been used as a base to show the existing conditions, accident diagrams and recommended improvements contained in the site analysis section of this report (Chapter IV).

D. Calculate Hazard Index

A hazard index was calculated for each site. The hazard index calculations form along with the various indicator values are shown in Figures 3 through 10. The factors entering into the hazard index calculation are as follows:

- Number of Accidents -- The average annual number of accidents for the four-year period from 1979 through 1982 was used to calculate this indicator (see Figure 3).

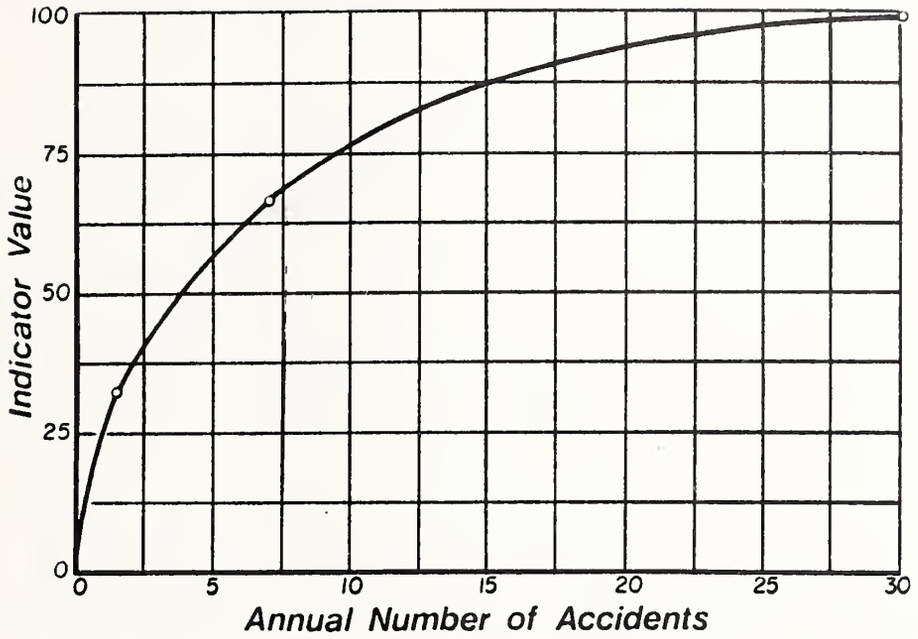
- Accident Rate -- The accident rate is expressed in accidents per million vehicle miles of travel. The average daily traffic (ADT) as determined from Montana Department of Highways traffic counts, and estimated ADT based on peak hour counts or land use, were used to compute this indicator (see Figure 4).

- Accident Severity -- Accident severity relates property damages, bodily injuries and fatalities to dollar costs. The unit costs shown in Figure 4 were used to calculate this indicator (see Figure [illegible] and Table 3).

- Volume/Capacity Rati[illegible] The 1983 average daily traffic and the 24-hour capacity [illegible]vel of Service) as calculated using the methods set for[illegible] the 1965 Highway Capacity Manual, were used to calcul[illegible]his indicator (see Figure 6).

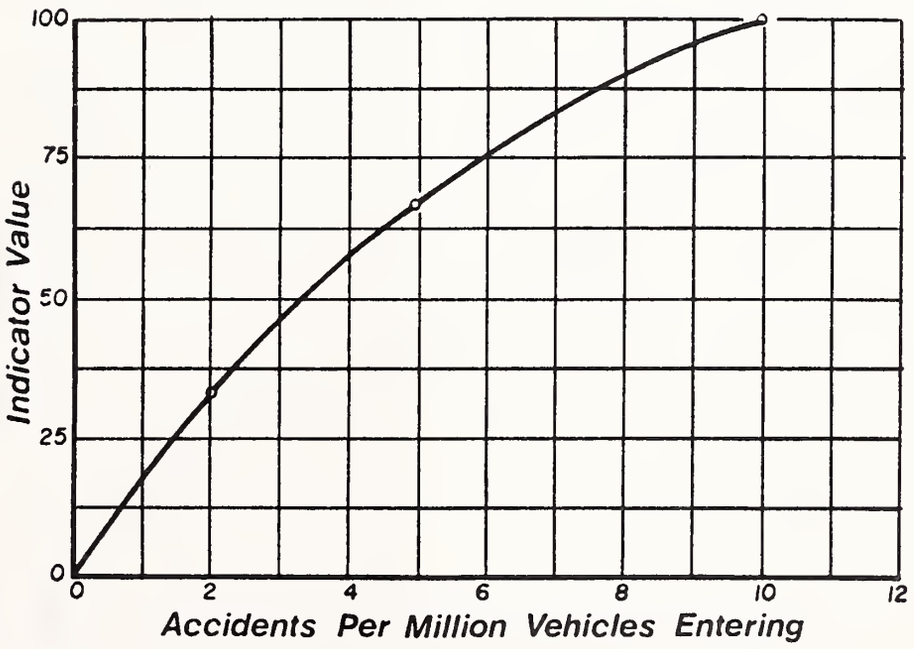
- Sight Distance -- [illegible] distances on all approaches were determined by the [illegible] survey. This was related to the required stopping distance to determine the indicator value of each location (see Figure 7).

- Driver Expectancy Problems and Information System Deficiencies -- The average rating values from the two independent field ratings were used to determine the values for these two indicators (see Figures 1, 2, 8, and 9).



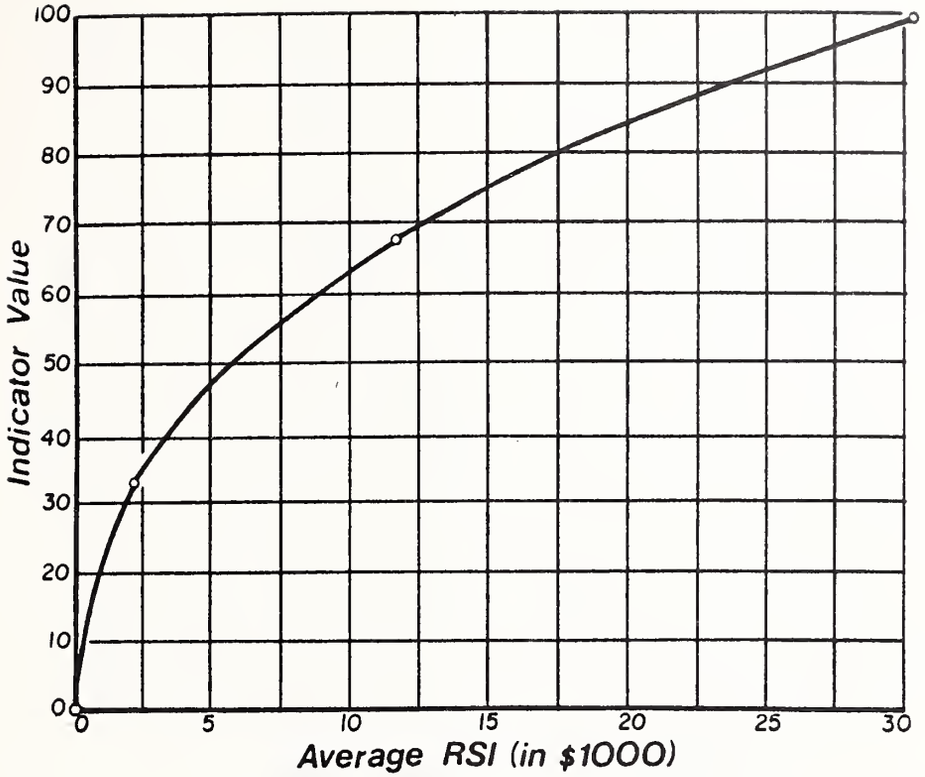
INDICATOR VALUES FOR NUMBER OF ACCIDENTS

Figure 3



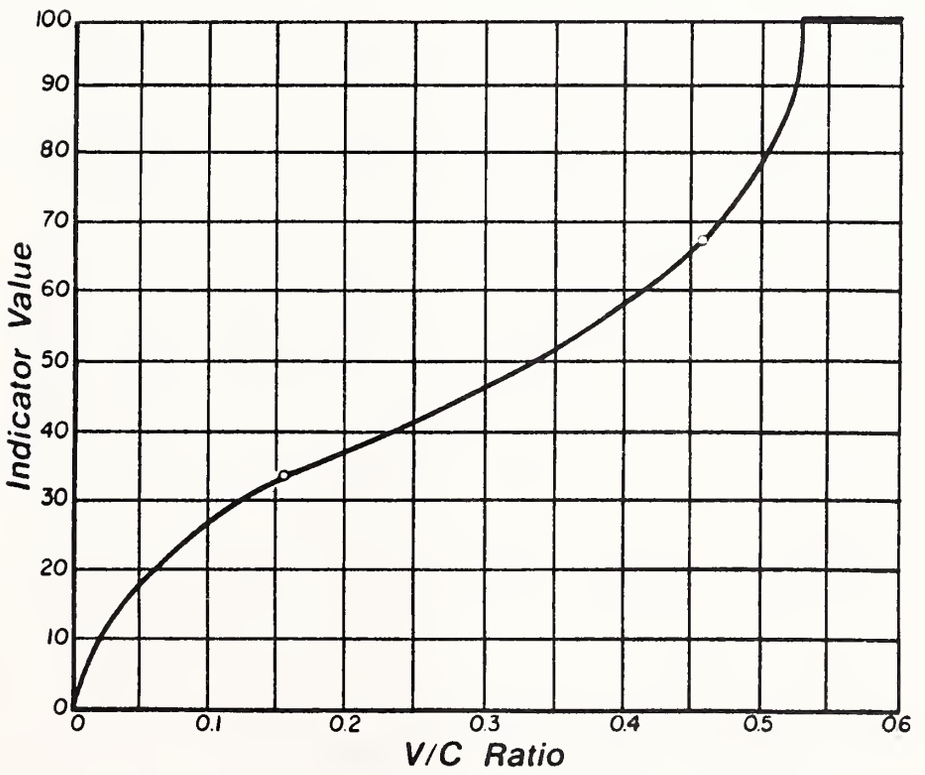
INDICATOR VALUES FOR ACCIDENT RATE

Figure 4



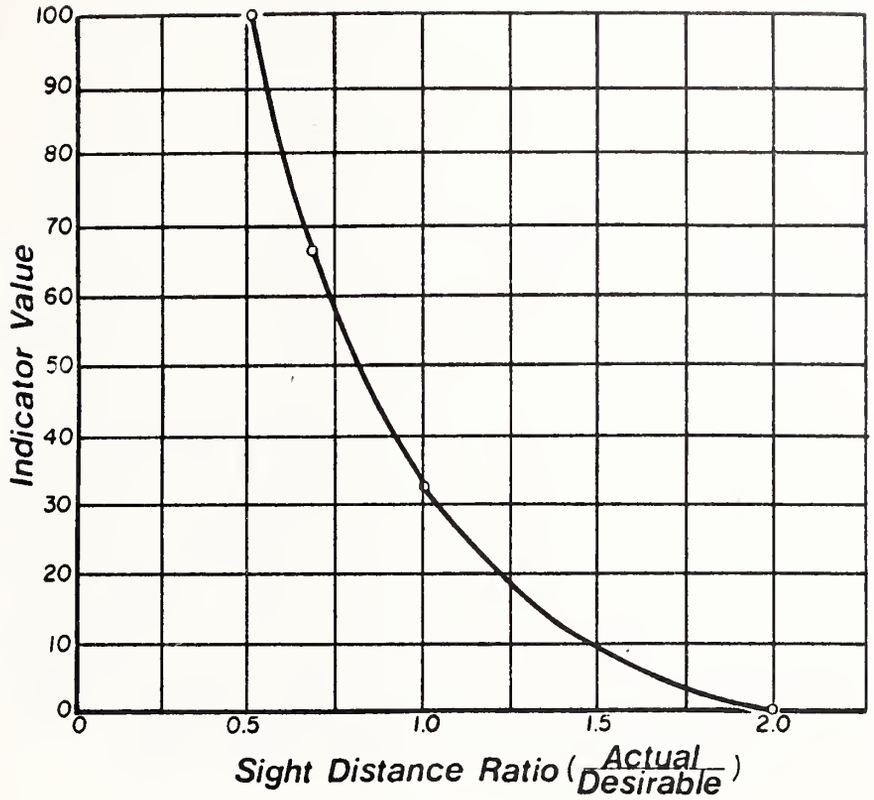
INDICATOR VALUE FOR
ACCIDENT SEVERITY

Figure 5



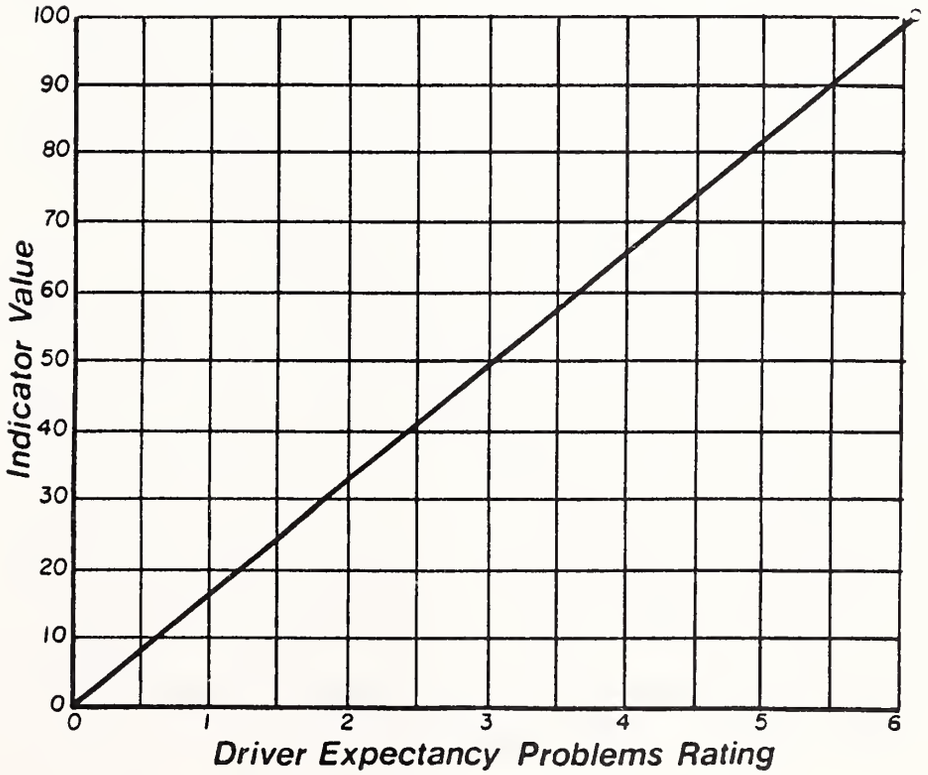
INDICATOR VALUES FOR
V/C RATIO

Figure 6



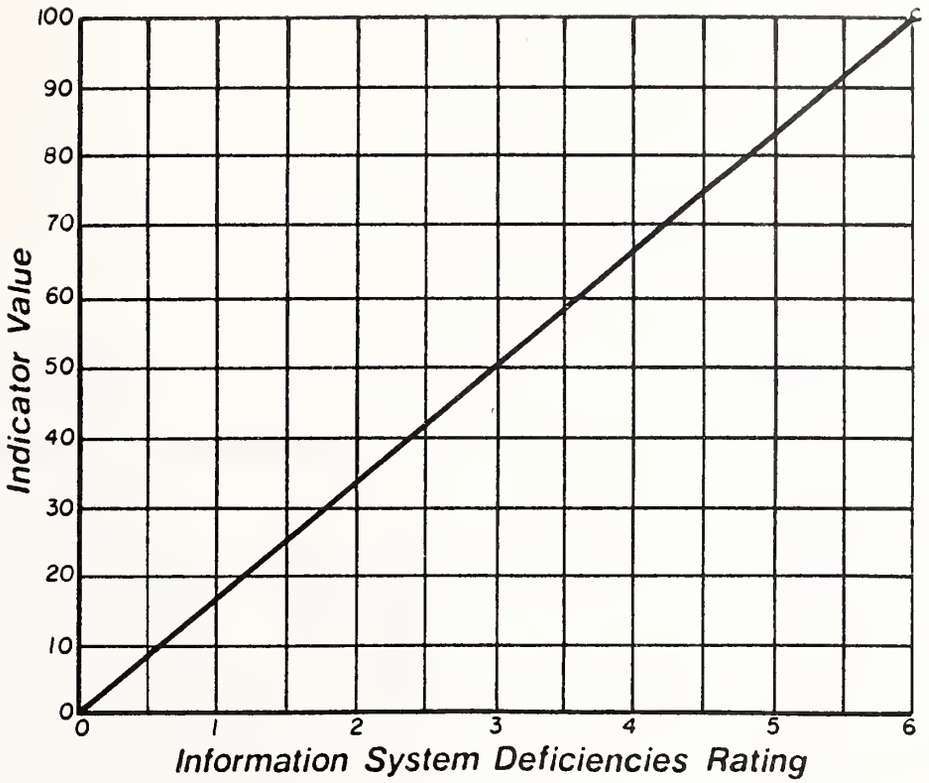
INDICATOR VALUES FOR SIGHT DISTANCE

Figure 7



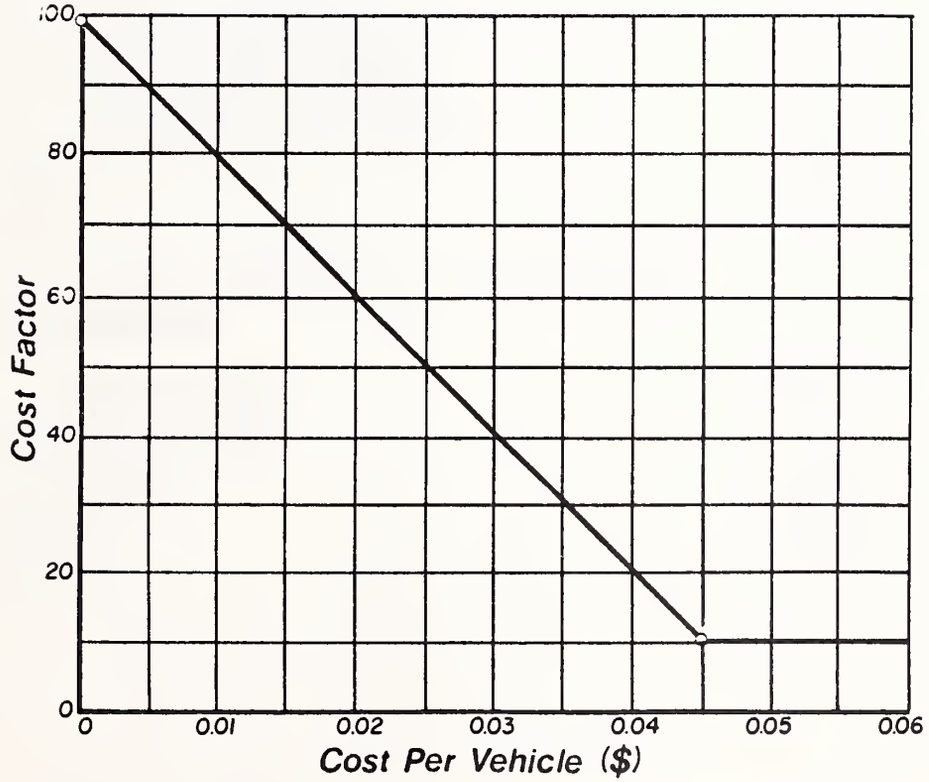
INDICATOR VALUES FOR DRIVER EXPECTANCY

Figure 8



INDICATOR VALUES FOR INFORMATION SYSTEM DEFICIENCIES

Figure 9



FORM FOR DETERMINATION OF COST FACTOR

Figure 10

TABLE 3

RELATIVE SEVERITY INDEX

TYPE OF ACCIDENT	RSI Urban	RSI Rural
Multi-Vehicle, At Intersection		
Enter at angle	$ 4,300	$14,400
From same direction - both going straight	2,800	5,100
From same direction - one turn, one straight	2,500	5,100
From same direction - one stopped	3,800	5,200
From same direction - all others	2,000	6,300
From opposite direction - both going straight	4,400	20,000
From opposite direction - one left turn, one straight	4,400	15,400
From opposite directions - all others	2,700	3,800
Not stated	3,800	5,200
Multi-Vehicle, Non-Intersection		
Going opposite direction - both moving	$ 4,400	$19,600
Going same direction - both moving	2,900	8,100
One car parked	1,600	2,400
One car stopped in traffic	4,200	6,800
One car entering parked position	1,900	2,300
One car leaving parked position	1,200	2,700
One car entering alley or driveway	3,400	6,000
One car leaving alley or driveway	2,000	4,400
All others	1,700	7,600
Not stated	3,400	6,000
Motor Vehicle with Pedestrian, At Intersection and Non-Intersection		
Vehicle going straight	$20,000	$49,000
Vehicle turning right	13,600	11,200
Vehicle turning left	17,100	11,200
Vehicle backing	20,600	11,200
All others	14,500	11,200
Not stated	11,200	11,200

TABLE 3

RELATIVE SEVERITY INDEX (Continued)

TYPE OF ACCIDENT	RSI Urban	RSI Rural
Single Vehicle, at Intersection		
Collision with train	$26,700	$39,100
Collision with bicycle	13,100	31,900
Injury in vehicle, jacknifed	5,200	2,000
Collision with fixed object in road	5,500	7,000
Overturned in road	9,200	7,500
Left road	5,200	12,300
Single Vehicle, Non-Intersection		
Collision with train	$26,700	$39,100
Collision with bicycle	13,100	31,900
Injury in vehicle, jacknifed	5,200	2,000
Collision with fixed object in road	6,300	9,200
Overturned in road	10,000	9,400
Left road at curve	7,600	12,400
Left road on straight road	5,200	10,500
Other One Motor Vehicle, At Intersection and Non-Intersection		
Fell from moving vehicle	$15,000	$57,200
Collision with animal	4,800	1,800
Collision with other object	4,700	4,400
All others	5,200	2,000
Not stated	3,200	3,400

Source: National Safety Council

- Hazard Index -- The hazard index for each site was calculated by combining the seven hazard rating indices. The hazardness of each location was used to rank the sites.

E. Develop Recommended Improvement Plans

A recommended improvement plan has been developed based on the layout sketch, accident analysis, field notes, traffic volumes and movements, photos, site inspections and local interviews. The improvements are shown on the location sketch for each site contained in Chapter IV.

Recommended improvements have been separated into two categories:

1. Short range improvements which consist of traffic control and minor geometric modifications.

2. Long range improvements including items such as major changes in alignment, reconstruction, new construction or recommendations related to future development in the area.

F. Cost Estimates

The cost estimates of the proposed improvements are based on recent bid prices for similiar projects. The costs are based on contract prices even through most of the short-term improvements can be accomplished by the county maintenance crew.

The estimated costs are used to determine the cost factor which is the improvement cost per vehicle entering the site over a five-year period. The five-year period represents the reasonable design life of the improvements.

Figure 10 is used to determine the cost factor for each site.

G. Calculate Priority Index

The priority index is determined by combining the hazard index and the cost index. The hazard index is given a 75 percent weight and the

cost index is weighted 25 percent. These calculations are shown in Chapter IV. The priority index is used to rank each site as shown in the priority listing in Chapter III.

H. Benefit/Cost Analysis

The Montana Department of Highways calculates the Benefit/Cost ratio of safety improvements in order to set priorities for on-system projects. It is possible that in the future, state or federal funds may be made available for off-system improvements. In anticipation of this possibility, the Benefit/Cost ratio for each site has been calculated using the MDOH method.

CHAPTER III

SUMMARY OF RECOMMENDATIONS

A. Improvement Priorities

Table 4 shows the final listing of improvement priorities based on the priority index which takes into account the hazardousness of each site and the cost of recommended improvements. The hazard index is given a 75 percent weight and the cost factor a 25 percent weight.

The Benefit/Cost ratio calculated using the Montana Department of Highway's method, is also shown for each site.

B. Implementation

The priority list should be used to develop an improvement schedule. The highest ranked site should be funded first and as funding becomes available, each site should be improved according to its respective rank.

If funds are not available to complete all improvements, traffic control device installation should be funded first. These are generally the most cost effective improvements and can be accomplished by the county maintenance crew. Widening, reconstruction or new construction improvements could be delayed until funding is available.

State law requires that all traffic control devices installed on the county road system conform to the standards set forth in the Manual on Uniform Traffic Control Devices for streets and highways (1978). The manual also specifies installation standards. By using uniform signs and markings and uniform placement, the driver becomes accustomed to obtaining clear information about the roadway by observing these devices.

TABLE 4

IMPROVEMENT PRIORITY LIST

Priority	Site No.	Location	Index	Cost
1	4	Curve on Indian Service Road 1 approximately 4.0 miles west of Crow Agency	73.48	$1,090
2	8	Intersection of Montana Highway 212 and Frontage Road of Little Horn Camp and Trailer Park	73.40	$ 965
3	1	Intersection of Old Highway 87 and Cemetery Road -- west of Hardin	70.39	$1,080
4	2	Sarpy Creek Road underpass at Burlington Northern Railroad crossing	68.95	$1,730
5	5	Crow Agency -- curve on Indian Service Road 1 at intersection of Industrial Park access road	68.55	$2,215
6	3	Intersection of Indian Service Road 8 and Indian Service Road 5, west of Pryor	64.81	$1,295
7	7	East Frontage Road -- north of Montana Highway 212 at Sun Lodge Motel	56.91	$ 900
8	6	Crow Agency -- intersection of Makawasha Avenue and Bala Street	53.30	$ 580
		Total cost		$9,855

New materials such as flexible delineators should be considered, especially in areas where delineators are subjected to repeated vehicular impacts.

In preparing this report, conversations with county road superintendents revealed that several counties have developed unique methods to carry out their county road programs. For example, in Valley County the road superintendent has developed a lay-down bridge end hazard marker post that is used on bridges where there is heavy farm equipment traffic. The county road superintendent in Custer County has a program for constructing precast bridge decks during the winter months.

An exchange of road construction and maintenance methods by counties throughout the state is a valuable source of information that may result in cost savings and statewide uniformity.

C. On-Going Program

The majority of the improvements recommended in this report are low cost and can be included in the county maintenance budget. Following implementation of the improvements, the annual county accident report provided by the Montana Department of Justice, Highway Traffic Safety Division, should be used to determine if a reduction of accidents at the improved locations has resulted. This will also enable the county road superintendent to determine the most effective safety improvements.

The accident cluster map which will be provided annually can be used to locate other high accident sites that can be targeted for future safety improvements.

The methods have been set forth in detail to enable the county to set up an on-going annual safety improvement schedule.

The following is a summary of the on-going safety improvement process:

1. Set up safety improvement schedule to implement recommended improvements set forth in this report, in order of priority and as funds become available.

2. Obtain annual plots of accidents occurring on county roads from the Montana Department of Justice, Highway Traffic Safety Division.

3. Use annual accident plots to evaluate effectiveness of safety improvements that have been implemented.

4. Use annual accident plots to determine high accident locations to be included in the on-going safety improvement program.

5. Obtain detailed accident reports for the selected sites from the Department of Justice.

6. Develop on-going improvement plan.

D. Funding Sources

The funding source for the recommended improvements will generally be from the county road budget. However, there are several state and federal programs that can be used to fund special improvements on off-system roads. These sources are described below:

- Bridge Replacement Program -- Fifteen percent of the federal funds received by the Montana Department of Highways for bridge replacement are allocated for the replacement of bridges on county off-system roads. Each county designates a priority bridge for replacement and funds are allocated according to need.

- Railroad Crossing Safety Funds -- The Montana Department of Highways rates all railroad crossings in the state according to the degree of hazard. This takes into account train volumes, vehicular traffic volumes, sight distance and other site characteristics. Funds are allocated statewide based on the hazard ratings.

- Coal Board Funds -- County roads directly impacted by coal extraction activities, may be eligible for funds from the State Coal Board.

- Coal Board Planning Funds -- Each county receives an annual allocation of planning funds from the State Coal Funds. These funds cannot be used for capital expenditures but are earmarked exclusively for planning activities. These funds could be used to carry out engineering studies for the on-going safety improvements program.

- Montana Department of Justice Safety Funds -- This project has been funded by the Montana Department of Justice, Highway Traffic Safety Division. The Division will continue to compile accident reports for each county. Some funding may be available to carry out the planning for the on-going safety improvement program.

 The Highway Traffic Safety Division has also funded county road traffic counting programs by providing traffic counting equipment.

- Federal funding legislation allows the use of federal funds on off-system road improvements. In the future, these funds may be available through the Montana Department of Highways.

CHAPTER IV

SITE ANALYSIS

This chapter presents, in detail, the analysis of each of the sites.

The information for each site consists of the following:

1. General location map showing site locations within the county
2. Photos of the sites
3. Sketch plan showing existing conditions
4. Sketch plan showing recommended improvements
5. Accident summary
6. Hazard index and priority index calculations

SITE LOCATION MAP
Big Horn County

Site No. 1

SITE #1
INTERSECTION OF OLD HIGHWAY 87 AND
CEMETERY ROAD WEST OF HARDIN

A. Description

This site is located 0.86 miles west of Hardin at the intersection of Old Highway 87 and the access road to Fairview Cemetery. Old U.S. Highway 87 is a 24-foot paved roadway, Cemetery Road is 20-feet wide with a paved surface. A bridge crossing the Two Leggins Canal is located 300 feet east of the intersection.

Until its closing in March 1981, a nightclub located just west of the site was a major traffic generator of vehicles involved in the recorded accidents at the site.

The intersection is controlled by two 24-inch X 24-inch, R1-1 stop signs on the north approach. There are standard object markers on the bridge ends.

The average daily traffic is estimated to be 450 vpd on the east approach, 380 vpd on the west approach, and 70 vpd on the north approach.

Figure 1-1 shows existing conditions.

B. Accident Characteristics

Thirteen reported accidents occurred at this site during the five-year period from 1979 through 1983. It is significant to note that eleven of the accidents occurred in 1979 and 1980 when the nightclub was in operation. These accidents were generally late at night and five listed alcohol as a possible violation.

Forty-six percent of the accidents occurred on the weekend. Eighty-five percent were during spring, summer, and fall months. Eighty-five percent of the accidents also occurred during the period from 9:00 PM through 3:00 AM. The remaining accidents occurred during daylight hours. Road condition was dry during ten of the accidents and wet and icy during the other three. Nine of the accidents involved single vehicles leaving the roadway. Two were due to vehicles parked in the travel lanes being rear-ended by moving vehicles. Five, or 38 percent, of the accidents involved alcohol as a possible violation. Speed and reckless driving contributed to 31 percent of the accidents. Seven of the accidents resulted in injuries.

Accident diagrams are shown on Figure 1-1. Table 1-1 summarizes accident characteristics at the site.

C. Evaluation

The following factors pertaining to the site were determined from the field survey and accident analysis.

1. No accidents were reported on the south leg of the intersection, however, the existing stop signs are 24-inch X 24-inch and in poor condition.

2. The nightclub that closed in March 1981 was obviously a major factor in the accidents occurring at this site.

3. Two of the accidents involved passing manuevers.

D. Recommendations

The following improvements are recommended for this site. The improvements are shown on Figure 1-2.

1. Delineate the east-west roadway on both sides through the high accident area.

2. Strip the east-west roadway for no passing in either direction through the intersection and 750 feet on each side of the intersection.

3. Replace the 24-inch X 24-inch, R1-1 stop signs on the south approach with 30-inch X 30-inch, R1-1 stop signs.

E. Cost Estimates

Item	Quantity	Unit	Unit Cost	Total Cost
Install delineators on east-west roadway	16	ea.	$20	$ 320
Stripe east-west roadway for no passing	1,500	lin.ft.	20¢	$ 300
Intall delineators on channelizing island	5	ea.	$20	$ 100
Replace existing stop signs with 30"X30", R1-1 stop signs	2	ea.	$180	360
			Total cost	$1,080

F. Hazard and Priority Indices

Based on the information collected and the foregoing analysis, the hazard index for this location is determined to be 61.19. The priority index is 70.39. The calculations are shown in Table 1-2.

Table 1-1

ACCIDENT SUMMARY

SITE NUMBER 1 ACCIDENT PERIOD 1979 - 1982

NUMBER OF ACCIDENTS BY YEAR

1979	1980	1981	1982-83
5	6	1	1

NUMBER OF ACCIDENTS BY DAY OF WEEK

Sun.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.
2	1	3	1		2	4

NUMBER OF ACCIDENTS BY MONTH

Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1				4	1	1	1	1		3	1

NUMBER OF ACCIDENTS BY TIME OF DAY

-- AM --												-- PM --											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
1	4	1			1									1						2			3

NUMBER OF ACCIDENTS BY LIGHT CONDITIONS

Day-light	Dark	Dawn	Dusk
2	11		

NUMBER OF ACCIDENTS BY ROAD CONDITIONS

Dry	Wet	Snow	Ice	Other
10	2		1	

NUMBER OF ACCIDENTS BY WEATHER CONDITIONS

Clear	Rain	Snow	Fog
12		1	

NUMBER OF ACCIDENTS BY ACCIDENT TYPE

Angle	Turn	Rear End	Fixed Object	Ped.	Animal	Side-swipe	Non-Col	Head-on	Backing
1		2	3			1	6		

NUMBER OF ACCIDENTS BY POSSIBLE VIOLATION

No Violat.	Drinking	Reckless Driving	Speed	Right-of-Way	Improper Passing	Improper Backing	Improper Turning	Other
3	5	1	3					1

NUMBER OF ACCIDENTS BY SEVERITY

	1979	1980	1981	1982-83
Injury	3	4		
Fatality				
Property Dam. Only	2	2	1	1

NUMBER OF ACCIDENTS ALCOHOL INVOLVED

5

Table 1-2

HAZARD INDEX CALCULATION

Site Number 1 Date January 1984

Site Description Intersection of Old Highway 87 and Cemetery Road -- west of Hardin

Indicator	Data Value		Indicator Value		Weight		Partial H.I.'s
Number of Accidents	2.60	acc/yr	39	X	0.164	=	6.40
Accident Rate	15.83	acc/MVE	100	X	0.225	=	22.50
Accident Severity	10,930	dollars	66	X	0.191	=	12.61
Volume/Capacity Ratio	0.08		23	X	0.082	=	1.89
Sight Distance Ratio	1.00	(wt.ave.)	32	X	0.074	=	2.37
Driver Expectancy	3.00	(wt.ave.)	51	X	0.149	=	7.60
Information System Deficiencies	4.00	(wt.ave.)	68	X	0.115	=	7.82

Hazard Index: 61.19

Cost of Recommended Improvements: $1,080

Cost Factor: 98

Priority Index = Hazard Index X .75 + Cost Factor X .25

61.19 X .75 + 98 X .25 = 70.39

SYMBOLS

- Moving Vehicle
- Backing Vehicle
- Pedestrian Path
- Parked Vehicle
- Fixed Object
- Fatal Accident
- Injury Accident

COLLISION TYPES

- Reor End
- Head On
- Side Swipe
- Out of Control
- Left Turn
- Right Angle

CONDITIONS

WEATHER:
F=Fog C=Clear R=Rain
S=Snow SL=Sleet

SURFACE: D=Dry W=Wet I=Icy

TIME → 1600 7/2/82 ← DATE
WEATHER → C D DARK ← LIGHT
SURFACE

N

LEGEND

- Power Pole
- Trees
- —70 Average Daily Traffic

70

STOP

R-175

irrigation Canal

Bridge

STOP

2420 1/15/83 C D DARK
2120 5/11/79 C D DARK
2400 11/25/79 S-I DARK
380
0230 11/24/79 C D DARK
0230 12/28/80 C W DARK
2420 7/11/80 C D DARK
1510 C D
8/11/81 DAY
0230 9/23/80 C D DARK
0350 5/24/80 C D DARK
2155 11/1/80 C D DARK
450
0600 6/2/80 C D DAY
0150 5/1/79 C W DARK
0200 5/2/79 C D DARK

SCALE
100' 0 100' 200'

Existing Conditions & Accidents

INTERSECTION OLD HIGHWAY 87 AND CEMETERY ROAD

SITE NO. 1
Big Horn County

Fig. No. 1-1

SCALE

100' 0 100' 200'

N

H = Double Faced Delineators To Be Installed

Replace Existing 24" x 24"
RI-1 Stop Signs With
30" x 30" RI-1 Stop Signs

STOP

STOP

Stripe Old Highway 87 For No Passing
Either Direction Through Intersection
Extending 750' On Each Approach

Recommended Improvements

INTERSECTION OLD HIGHWAY 87 AND CEMETERY ROAD

SITE NO. 1

Big Horn County

Fig. No.

1·2

Site No. 2

SITE NO. 2 - SARPY CREEK ROAD UNDERPASS AT BURLINGTON NORTHERN RAILROAD CROSSING



North Approach



South Approach

SITE #2

SARPY CREEK ROAD UNDERPASS AT

BURLINGTON NORTHERN RAILROAD CROSSING

A. Description

This site is located on Sarpy Creek Road, approximately 1.0 mile east of Montana Highway 284. The Burlington Northern Railroad track crosses the road on a timber trestle near the midpoint of the site. The reported accidents occurred on the east and west ends of the site, however, there was a 1975 accident involving a vehicle hitting the trestle.

The road is 25 to 32 feet wide with a gravel surface. The 25-foot width is at the railroad trestle. From the west the road approaches the trestle on a curve and a 3.5 percent downgrade which shortens the sight distance. From the east there is a 4 percent downhill grade coming into the trestle, sight distance from this approach to the west is limited by a curve, road embankment and the trestle structure. There is a guard rail at the east end of the trestle. There are no traffic control devices at this site.

Traffic on this road is primarily by workers at the Absalako Mine, such as haul trucks and other traffic associated with the mine. It was observed during the field survey that the road was heavily used by hunters. The average daily traffic is estimated to be 280 vpd.

Figure 2-1 shows existing conditions.

B. Accident Characteristics

Two reported accidents occurred at this site during the four-year period from 1979 through 1982. Both accidents involved single vehicles leaving the road and overturning. Both resulted in injuries. One

accident was attributed to loss of control on an icy road and the other to being forced off the road by a haul truck. The accidents occurred during the week in November and January. One occurred at 7:50 AM and the other at 5:45 PM.

Another accident involving a westbound vehicle hitting the trestle was reported in 1975.

Accident diagrams are shown in Figure 2-1. Table 2-1 summarizes accident characteristics at the site.

C. Evaluation

The following factors pertaining to the site were determined from the field survey and accident analysis.

1. Sight distance from both approaches to the trestle is limited indicating the need for improved driver information.

2. The collision with the trestle indicates the need for improved delineation.

D. Recommendations

The following improvements are recommended for this site. The improvements are shown on Figure 2-2.

1. Install 30-inch X 30-inch, W1-2R curve right signs in advance of approach curves on east and west sides of the trestle. These curves are not shown on Figure 2-1 and 2-2. Placement of the signs should be determined in the field.

2. Install 36-inch X 36-inch, W5-1, road narrows signs on the east and west approaches to the trestle.

3. Install 12-inch X 36-inch, OM-3R and OM-3L object markers on the east and west ends of the trestle.

4. Install bi-directional delineators on the east and west approaches to the trestle.

E. Cost Estimates

Item	Quantity	Unit	Unit Cost	Total Cost
Install 30"X30", W1-2R curve right signs	2	ea.	$180	$ 360
Install 36"X36", W5-1 road narrows signs	2	ea.	$225	$ 450
Install 12"X36", OM-3R and OM-3L object markers	4	ea.	$130	$ 520
Install bi-directional delineators	20	ea.	$20	$ 400
			Total cost	$1,730

Note: These improvements may be eligible for funding from the Montana Coal Board. It may not be cost effective to apply for funds for this project along, however, if it could be coordinated with other road improvements on roads impacted by coal related activities, it may be feasible to apply for these funds.

F. Hazard and Priority Indices

Based on the information collected and the foregoing analysis, the hazard index for this location is determined to be 60.60. The priority index is 68.95. The calculations are shown in Table 2-2.

Table 2-1

ACCIDENT SUMMARY

SITE NUMBER 2 ACCIDENT PERIOD 1979 - 1982

NUMBER OF ACCIDENTS BY YEAR

1979	1980	1981	1982
	1	1	

NUMBER OF ACCIDENTS BY DAY OF WEEK

Sun.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.
			1	1		

NUMBER OF ACCIDENTS BY MONTH

Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1										1	

NUMBER OF ACCIDENTS BY TIME OF DAY

-- AM --																						-- PM --	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
						1										1							

NUMBER OF ACCIDENTS BY LIGHT CONDITIONS

Day-light	Dark	Dawn	Dusk
1			1

NUMBER OF ACCIDENTS BY ROAD CONDITIONS

Dry	Wet	Snow	Ice	Other
1			1	

NUMBER OF ACCIDENTS BY WEATHER CONDITIONS

Clear	Rain	Snow	Fog
		1	

NUMBER OF ACCIDENTS BY ACCIDENT TYPE

Angle	Turn	Rear End	Fixed Object	Ped.	Animal	Side-swipe	Non-Col	Head-on	Backing
							1		

NUMBER OF ACCIDENTS BY POSSIBLE VIOLATION

No Violat.	Drinking	Reckless Driving	Speed	Right-of-Way	Improper Passing	Improper Backing	Improper Turning	Other
1								

NUMBER OF ACCIDENTS BY SEVERITY

	1979	1980	1981	1982
Injury		1	1	
Fatality				
Property Dam. Only				

NUMBER OF ACCIDENTS ALCOHOL INVOLVED

0

Table 2-2

HAZARD INDEX CALCULATION

Site Number 2 Date January 1984

Site Description Sarpy Creel Road underpass at Burlington Northern Railroad crossing

Indicator	Data Value		Indicator Value		Weight		Partial H.I.'s
Number of Accidents	0.50	acc/yr	13	X	0.164	=	2.13
Accident Rate	4.89	acc/MVE	79	X	0.225	=	17.78
Accident Severity	12,400	dollars	70	X	0.191	=	13.37
Volume/Capacity Ratio	0.09		24	X	0.082	=	1.97
Sight Distance Ratio	0.50	(wt.ave.)	100	X	0.074	=	7.40
Driver Expectancy	4.00	(wt.ave.)	68	X	0.149	=	10.13
Information System Deficiencies	4.00	(wt.ave.)	68	X	0.115	=	7.82

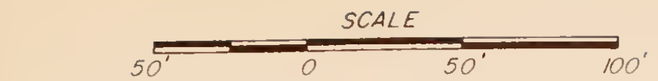
Hazard Index: 60.60

Cost of Recommended Improvements: $1,730

Cost Factor: 94

Priority Index = Hazard Index X .75 + Cost Factor X .25

60.60 X .75 + 94 X .25 = - 68.95



SYMBOLS

- Moving Vehicle
- Backing Vehicle
- Pedestrian Path
- Parked Vehicle
- Fixed Object
- Fatal Accident
- Injury Accident

COLLISION TYPES

- Rear End
- Head On
- Side Swipe
- Out of Control
- Left Turn
- Right Angle

LEGEND

- Wire Fence
- 280 Average Daily Traffic

CONDITIONS

WEATHER:
F=Fog C=Clear R=Rain
S=Snow SL=Sleet

SURFACE: D=Dry W=Wet I=Icy

TIME → 1600 7/2/82 ← DATE
WEATHER → C D DARK ← LIGHT
SURFACE

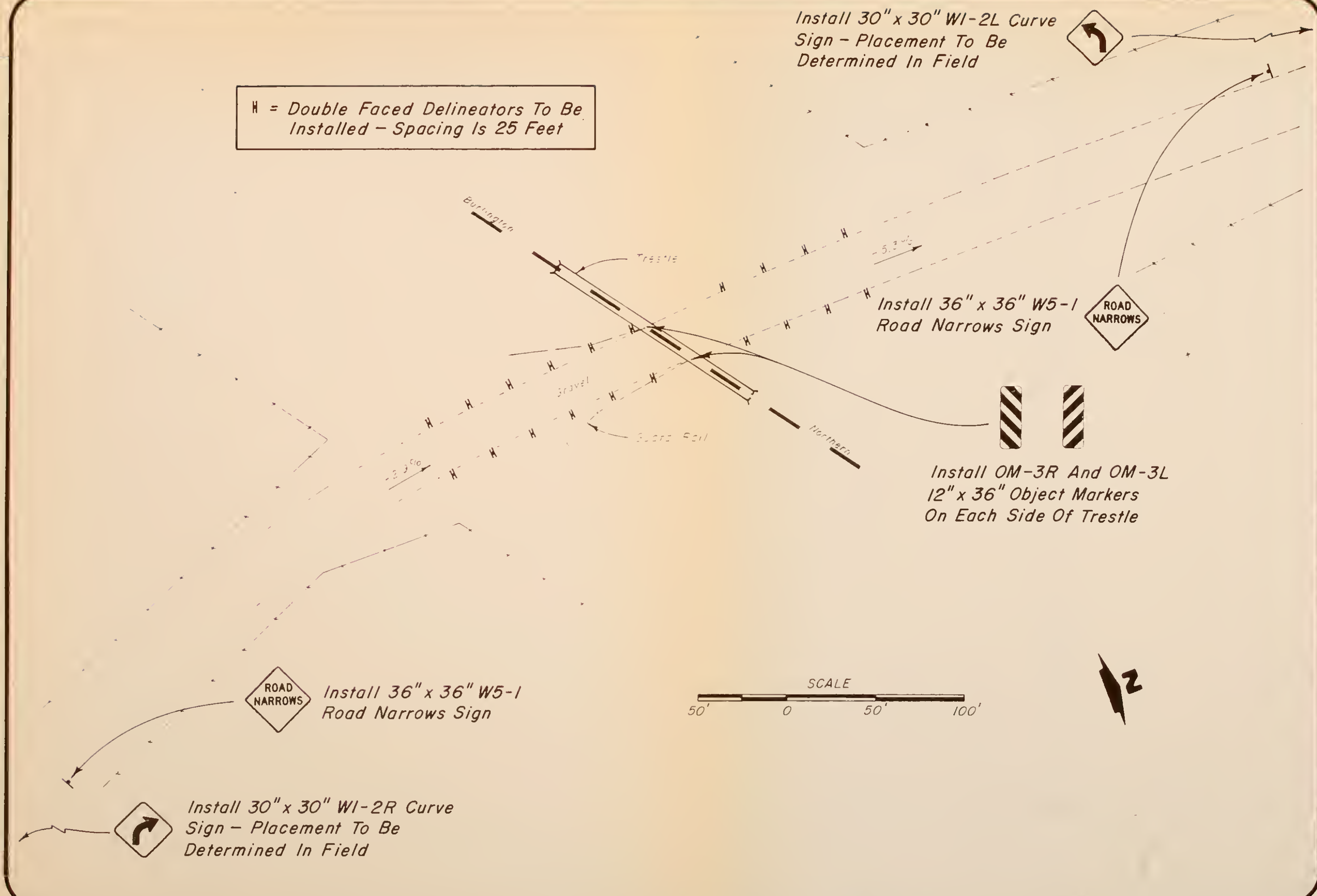
2 Existing Conditions & Accidents

SARPY CREEK ROAD UNDERPASS AT
BURLINGTON NORTHERN RAILROAD CROSSING

SITE NO. 4
Big Horn County

Fig. No.
2·1

H = Double Faced Delineators To Be Installed – Spacing Is 25 Feet



Install 30" x 30" WI-2L Curve Sign – Placement To Be Determined In Field

Install 36" x 36" W5-1 Road Narrows Sign

Install OM-3R And OM-3L 12" x 36" Object Markers On Each Side Of Trestle

Install 36" x 36" W5-1 Road Narrows Sign

Install 30" x 30" WI-2R Curve Sign – Placement To Be Determined In Field

SCALE
50' 0 50' 100'

N

Recommended Improvements

SARPY CREEK ROAD UNDERPASS AT BURLINGTON NORTHERN RAILROAD CROSSING

SITE NO. 2

Big Horn County

Fig. No. 2-2

Site No. 3

SITE NO. 3 - INTERSECTION OF INDIAN SERVICE ROAD 8 AND INDIAN SERVICE ROAD 5



North Approach



South Approach



West Approach

SITE #3

INTERSECTION OF INDIAN SERVICE ROAD 8

AND INDIAN SERVICE ROAD 5 -- WEST OF PRYOR

A. Description

This site is located approximately 0.7 miles southwest of Pryor at the intersection of Indian Service Roads (I.S.) 8 and 5. I.S. Road 5 is 30 feet wide with a paved surface. The road has a centerline and shoulder stripes. I.S. Road 8 is paved west from the intersection to a point 100 feet west of the entrance to the Chief Plenty Coups Memorial State Park entrance. The road is 30 feet in width. There is a 3- to 4-foot deep irrigation ditch on the east side of the intersection.

Traffic control consists of a 30-inch X 30-inch, W2-5, "T" symbol sign on the west approach and a stop sign at the west approach. Three flexible delineators are located on the east side of the intersection. These delineators show signs of numerous collisions. There is a 30-inch X 30-inch, W1-2R, right curve sign on the east side of the north approach 650 feet from the intersection. This sign is in reference to a right curve approximately 1,400 feet north of the intersection.

Traffic volumes on this road have a high seasonal variation due to traffic generated by the Chief Plenty Coups Museum and picnic area. Taking this into consideration, the estimated annual average daily traffic is as follows:

Leg	Vehicles per Day
North	880
South	500
West	370

Figure 3-1 shows existing conditions.

B. Accident Characteristics

Two reported accidents occurred at this location during the four-year period from 1979 through 1982. During the field survey it was observed that the three flexible delineators located on the east side of the intersection had been hit a number of times. One delineator had been broken off 12 inches from the ground. Field tests with this type of delineator have shown them to be highly resiliant to impact, indicating that a number of vehicles have run the stop sign at this location but no accident reports were filed.

The accidents occurred on a Saturday in August and a Tuesday in September. Both accidents occurred between noon and 2:00 PM. The road condition was dry and the weather clear during both accidents. One accident involved an eastbound vehicle failing to stop and colliding with a southbound vehicle. The other involved a single vehicle leaving the road. One accident resulted in injuries.

Accident diagrams are shown in Figure 3-1. Table 3-1 summarizes accident characteristics at the site.

C. Evaluation

The following factors pertaining to the site were determined from the field survey and accident analysis:

1. Accident experience and physical evidence at the site indicates that vehicles are failing to observe the stop sign on the west leg of the intersection.

2. The Chief Plenty Coups Memorial State Park generates traffic with drivers who are unfamiliar with the area requiring a high level of driver information.

D. Recommendations

The following improvements are recommended for this site. The improvements are shown on Figure 3-2.

1. Install 30-inch X 30-inch, W1-2R and W1-2L, curve right and left signs on the south and north approaches to the intersection.

2. Install 30-inch X 30-inch, W2-2R and W2-2L, 45-degree side road right and left signs on the north and south approaches.

3. Install a 36-inch X 36-inch, W3-1, stop ahead sign on the west approach.

4. Raise the existing stop sign on the west approach to a minimum height of five feet above the pavement.

5. Restripe the north-south roadway for 750 feet on each side of the intersection to prohibit passing in either direction.

E. Cost Estimates

Item	Quantity	Unit	Unit Cost	Total Cost
Install 30"X30", W1-2R and W1-2L, curve signs	2	ea.	$180	$ 360
Install 30"X30", W2-2R and W2-2L, 45-degree side road signs	2	ea.	$180	$ 360
Install 36"X36", W3-1, stop ahead sign	1	ea.	$225	$ 225
Raise existing stop sign	1	ea.	$50	$ 50
Restripe north-south roadway	1,500	lin.ft.	20¢	$ 300
			Total cost	$1,295

F. Hazard and Priority Indices

Based on the information collected and the foregoing analysis, the hazard index for this location is determined to be 53.75. The priority index is 64.81. The calculations are shown in Table 3-2.

Table 3-1

ACCIDENT SUMMARY

SITE NUMBER 3 ACCIDENT PERIOD 1979 - 1982

NUMBER OF ACCIDENTS BY YEAR

1979	1980	1981	1982
	1	1	

NUMBER OF ACCIDENTS BY DAY OF WEEK

Sun.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.
		1				1

NUMBER OF ACCIDENTS BY MONTH

Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
							1	1			

NUMBER OF ACCIDENTS BY TIME OF DAY

-- AM --												-- PM --											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
										1	1												

NUMBER OF ACCIDENTS BY LIGHT CONDITIONS

Day-light	Dark	Dawn	Dusk
2			

NUMBER OF ACCIDENTS BY ROAD CONDITIONS

Dry	Wet	Snow	Ice	Other
2				

NUMBER OF ACCIDENTS BY WEATHER CONDITIONS

Clear	Rain	Snow	Fog
2			

NUMBER OF ACCIDENTS BY ACCIDENT TYPE

Angle	Turn	Rear End	Fixed Object	Ped.	Animal	Side-swipe	Non-Col	Head-on	Backing
1							1		

NUMBER OF ACCIDENTS BY POSSIBLE VIOLATION

No Violat.	Drinking	Reckless Driving	Speed	Right-of-Way	Improper Passing	Improper Backing	Improper Turning	Other
1				1				

NUMBER OF ACCIDENTS BY SEVERITY

	1979	1980	1981	1982
Injury		1		
Fatality				
Property Dam. Only			1	

NUMBER OF ACCIDENTS ALCOHOL INVOLVED

0

Table 3-2

HAZARD INDEX CALCULATION

Site Number 3 Date January 1984

Site Description Intersection of Indian Service Road 8 and Indian Service Road 5 -- west of Pryor

Indicator	Data Value		Indicator Value		Weight		Partial H.I.'s
Number of Accidents	0.50	acc/yr	13	X	0.164	=	2.13
Accident Rate	1.57	acc/MVE	36	X	0.225	=	8.10
Accident Severity	13,400	dollars	72	X	0.191	=	13.75
Volume/Capacity Ratio	0.13		30	X	0.082	=	2.46
Sight Distance Ratio	0.50	(wt.ave.)	100	X	0.074	=	7.40
Driver Expectancy	4.00	(wt.ave.)	68	X	0.149	=	10.13
Information System Deficiencies	5.00	(wt.ave.)	85	X	0.115	=	9.78

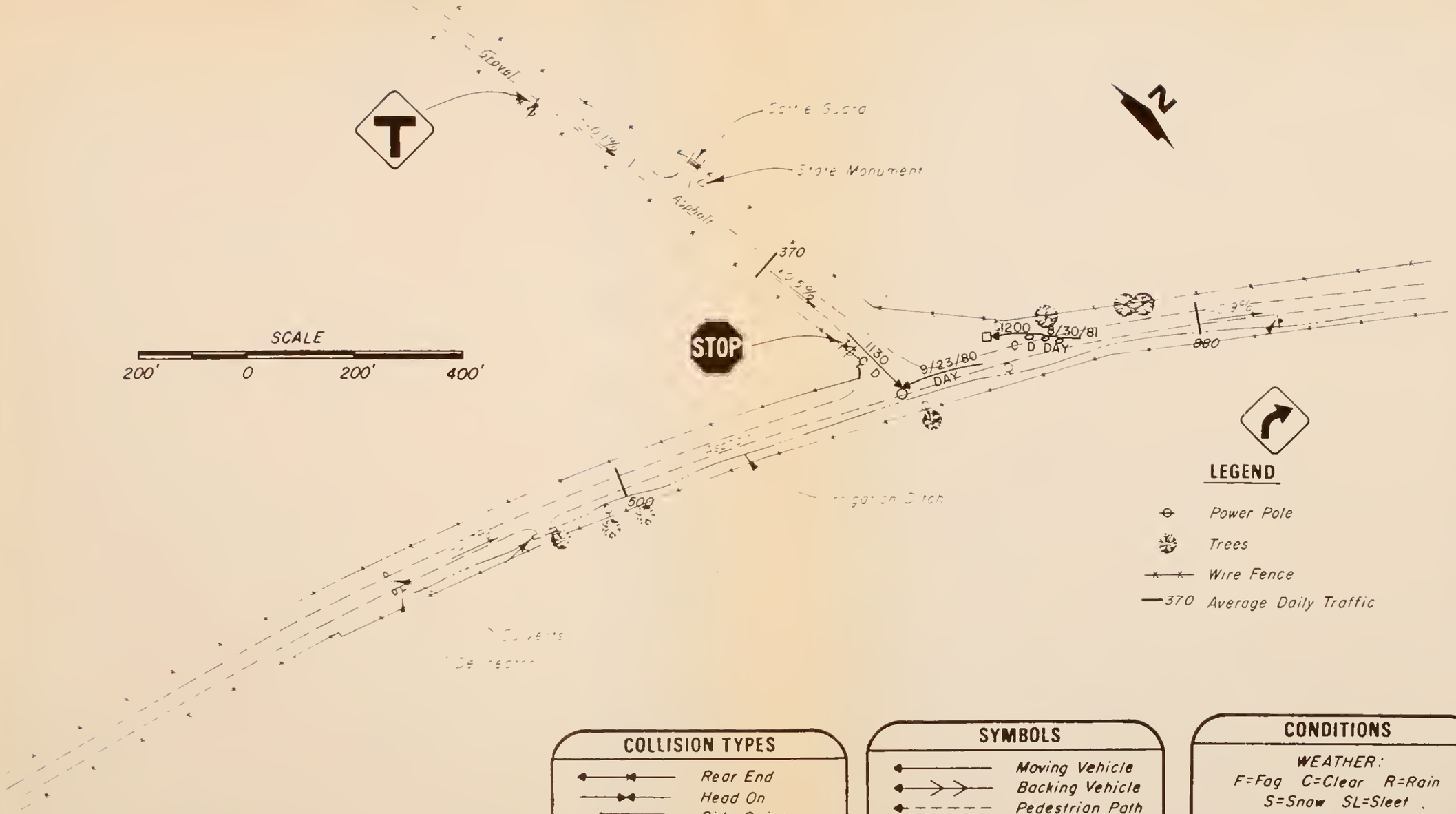
Hazard Index: 53.75

Cost of Recommended Improvements: $1,295

Cost Factor: 98

Priority Index = Hazard Index X .75 + Cost Factor X .25

53.75 X .75 + 98 X .25 = 64.81

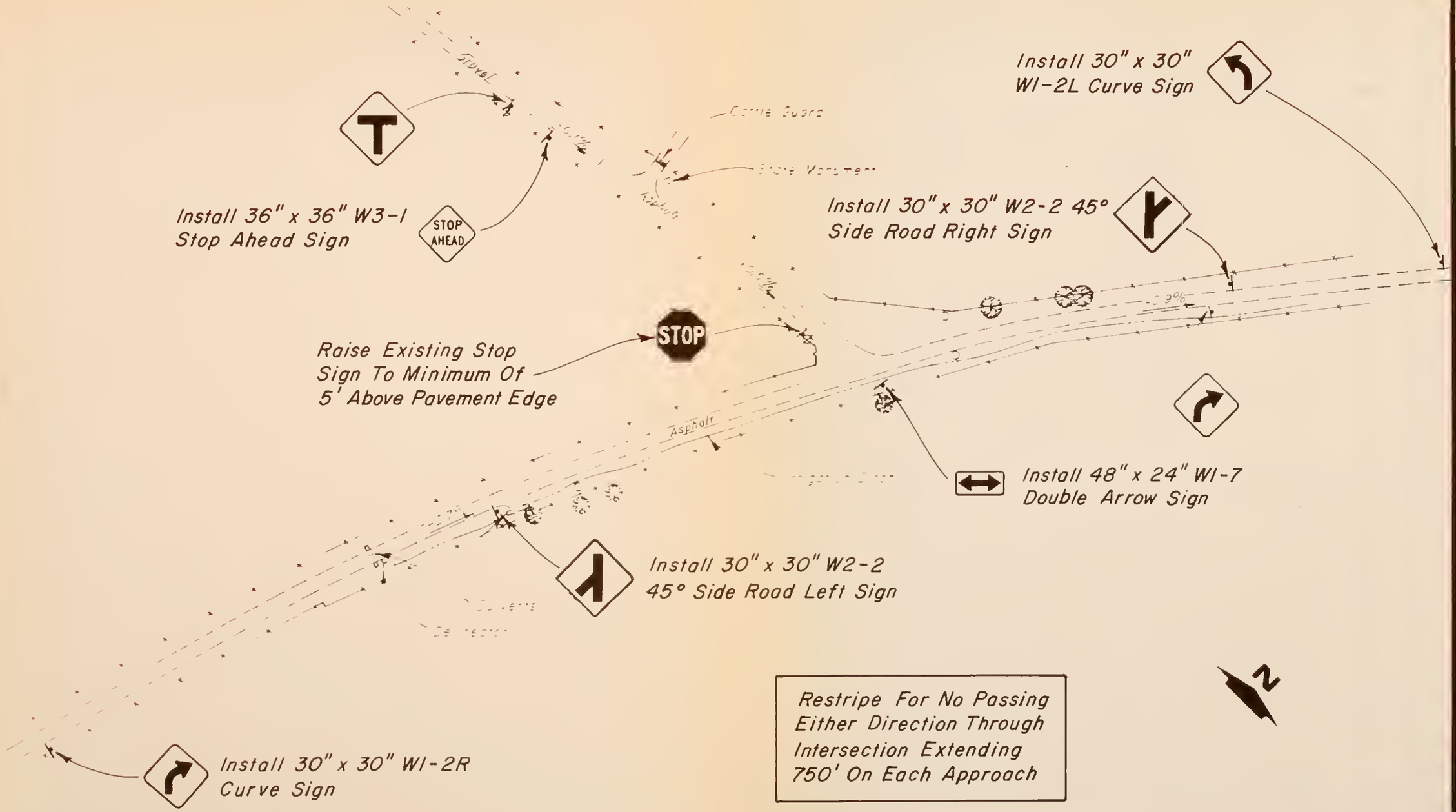


3 Existing Conditions & Accidents

INTERSECTION OF INDIAN SERVICE ROAD 8
AND INDIAN SERVICE ROAD 5

SITE NO.
Big Horn County

Fig. No.
3-1



Recommended Improvements

INTERSECTION OF INDIAN SERVICE ROAD 8
AND INDIAN SERVICE ROAD 5

SITE NO. 3
Big Horn County

Fig. No.
3·2

Site No. 4

SITE NO. 4 - CURVE ON INDIAN SERVICE ROAD 1 APPROXIMATELY 4.0 MILES WEST OF CROW AGENCY



East Approach



Northwest Approach

SITE #4

CURVE ON INDIAN SERVICE ROAD 1,

APPROXIMATELY 4.0 MILES WEST OF CROW AGENCY

A. Description

This site consists of a curve on I.S. Road 1, approximately 4.0 miles west of the Crow Agency. From this site west, the roadway passes through rolling hills with curves having similiar characteristics to this location. This location is the first major curve a westbound driver experiences, which may be a contributing factor in accidents occurring at this particular site.

The road is 28 to 30 feet in width, with a paved surface. The surface is raveling at the edges. The superelevation on the curve is 0.02 to 0.03 feet per foot.

The road is scheduled for an overlay with new signing and striping.

The estimated average daily traffic is 180 vpd.

Figure 4-1 shows existing conditions.

B. Accident Characteristics

Two reported accidents occurred at this site during the four-year period from 1979 through 1982. Both accidents were in 1981. The accidents occurred on a Sunday and a Friday in January and November. Both accidents were during hours of darkness. Road condition was dry and the weather was clear. Both accidents involved single vehicles leaving the roadway.

Accident diagrams are shown in Figure 4-1. Table 4-1 summarizes accident characteristics at the site.

C. Evaluation

The following factors pertaining to the site were determined from the field survey and accident analysis.

1. The superelevation on the curve should be increased.

2. There is no curve sign on the west approach.

3. Drivers approaching from the east may not be aware of the change in the general characteristics of the road from this curve, west.

D. Recommendations

The following improvements are recommended for this site. The improvements are shown on Figure 4-2.

1. Replace curve sign on the east approach with a 30-inch X 30-inch, W1-4R reverse curve sign.

2. Install a 30-inch X 30-inch, W1-2L curve left sign on the west approach.

3. Replace existing W1-1L damage turn sign on north shoulder of west approach.

4. Install two 48-inch X 24-inch, W1-7 large arrow signs on curve.

5. Install bi-directional delineators on outside of curve.

6. When overlay, signing and striping improvements are made, increase the superelevation on the curve and evaluate signing and striping on curves to the west.

E. Cost Estimates

Item	Quantity	Unit	Unit Cost	Total Cost
Replace existing sign with 30"X30", W1-4R reverse curve sign	1	ea.	$145	$ 145

Item	Quantity	Unit	Unit Cost	Total Cost
Install 30"X30", W1-2L curve left sign	1	ea.	$180	$ 180
Replace damaged turn sign	1	ea.	$145	$ 145
Install 48"X24", large arrow signs	2	ea.	$210	$ 420
Install bi-directional delineators	10	ea.	$20	200
			Total cost	$1,090

F. Hazard and Priority Indices

Based on the information collected and the foregoing analysis, the hazard index for this location is determined to be 66.64. The priority index is 73.48. The calculations are shown in Table 4-2.

Table 4-1

ACCIDENT SUMMARY

SITE NUMBER 4 ACCIDENT PERIOD 1979 - 1982

NUMBER OF ACCIDENTS BY YEAR

1979	1980	1981	1982
		2	

NUMBER OF ACCIDENTS BY DAY OF WEEK

Sun.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.
1					1	

NUMBER OF ACCIDENTS BY MONTH

Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1										1	

NUMBER OF ACCIDENTS BY TIME OF DAY

-- AM --												-- PM --											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
																	1					1	

NUMBER OF ACCIDENTS BY LIGHT CONDITIONS

Day-light	Dark	Dawn	Dusk
	2		

NUMBER OF ACCIDENTS BY ROAD CONDITIONS

Dry	Wet	Snow	Ice	Other
2				

NUMBER OF ACCIDENTS BY WEATHER CONDITIONS

Clear	Rain	Snow	Fog
2			

NUMBER OF ACCIDENTS BY ACCIDENT TYPE

Angle	Turn	Rear End	Fixed Object	Ped.	Animal	Side-swipe	Non-Col	Head-on	Backing
			1				1		

NUMBER OF ACCIDENTS BY POSSIBLE VIOLATION

No Violat.	Drinking	Reckless Driving	Speed	Right-of-Way	Improper Passing	Improper Backing	Improper Turning	Other
			2					

NUMBER OF ACCIDENTS BY SEVERITY

	1979	1980	1981	1982
Injury			2	
Fatality				
Property Dam. Only				

NUMBER OF ACCIDENTS ALCOHOL INVOLVED

0

Table 4-2

HAZARD INDEX CALCULATION

Site Number 4 Date January 1984

Site Description Curve on Indian Service Road 1 approximately 4.0 miles west of Crow Agency

Indicator	Data Value		Indicator Value		Weight		Partial H.I.'s
Number of Accidents	0.50	acc/yr	13	X	0.164	=	2.13
Accident Rate	7.60	acc/MVE	100	X	0.225	=	22.50
Accident Severity	12,400	dollars	70	X	0.191	=	13.37
Volume/Capacity Ratio	0.04		15	X	0.082	=	1.23
Sight Distance Ratio	0.50	(wt.ave.)	100	X	0.074	=	7.40
Driver Expectancy	4.00	(wt.ave.)	68	X	0.149	=	10.13
Information System Deficiencies	5.00	(wt.ave.)	85	X	0.115	=	9.78

Hazard Index: 66.45

Cost of Recommended Improvements: $1,090

Cost Factor: 94

Priority Index = Hazard Index X .75 + Cost Factor X .25

66.64 X .75 + 94 X .25 = 73.48

LEGEND

- Trees
- Wire Fence
- —180 Average Daily Traffic

SYMBOLS

- Moving Vehicle
- Backing Vehicle
- Pedestrian Path
- Parked Vehicle
- Fixed Object
- Fatal Accident
- Injury Accident

COLLISION TYPES

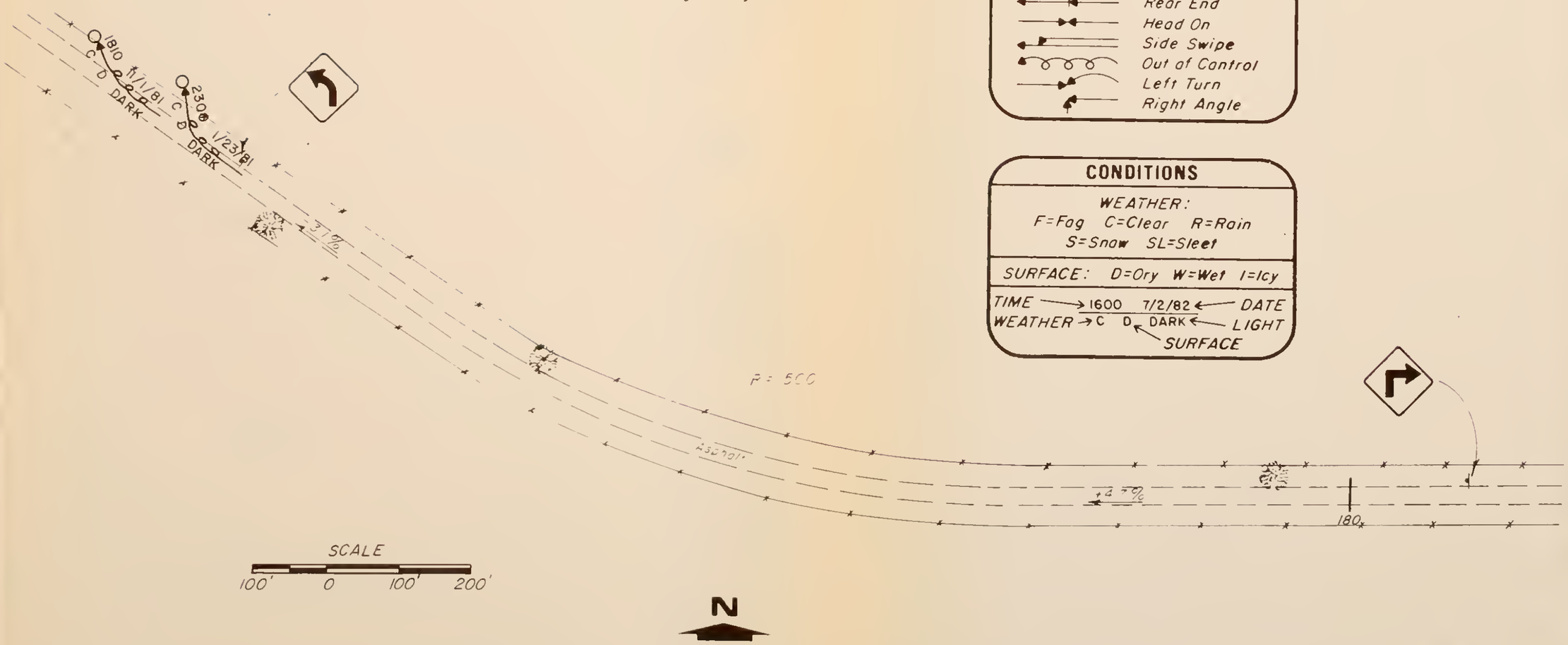
- Rear End
- Head On
- Side Swipe
- Out of Control
- Left Turn
- Right Angle

CONDITIONS

WEATHER:
F=Fog C=Clear R=Rain
S=Snow SL=Sleet

SURFACE: D=Dry W=Wet I=Icy

TIME → 1600 7/2/82 ← DATE
WEATHER → C D DARK ← LIGHT
SURFACE



SCALE
100' 0 100' 200'

N

Existing Conditions & Accidents

CURVE ON INDIAN SERVICE ROAD I APPROXIMATELY 40 MILES WEST OF CROW AGENCY

SITE NO. 4
Big Horn County

Fig. No. 4-1

Install 30" x 30"
W1-2L Curve Sign

Replace Damaged Sign

H = Double Faced Delineators To Be Installed

Replace Damaged Sign With
30" x 30" W1-2R Curve Sign

Delineator Spacing
On Curve Is 100 Feet

N

SCALE
100' 0 100' 200'

Install 48" x 24" W1-7L
And W1-7R Arrow Signs

Recommended Improvements

CURVE ON INDIAN SERVICE ROAD I
APPROXIMATELY 40 MILES WEST OF
CROW AGENCY

SITE NO. 4
Big Horn County

Fig. No.
4·2

Site No. 5

SITE NO. 5 - CROW AGENCY - CURVE ON INDIAN SERVICE ROAD I AT INTERSECTION OF INDUSTRIAL PARK ACCESS ROAD



South Approach



West Approach

SITE #5

CROW AGENCY -- CURVE ON INDIAN SERVICE ROAD 1

AT INTERSECTION OF INDUSTRIAL PARK ACCESS ROAD

A. Description

This site consists of a curve on Indian Service Road 1 at the Crow Agency just west of Interstate 90. An access road to the Industrial Park intersects at mid-curve.

The road is 28 to 30 feet in width with a paved surface. The road has centerline and shoulder stripes, however, these were worn and in need of maintenance at the time the field survey was conducted. Traffic control consists of 30-inch X 30-inch, W1-2R and W1-2L, curve signs on the west and south approaches. Twenty-five mile per hour, 24-inch X 30-inch, R2-1 speed limit signs are mounted under the curve signs. The calculated design speed for the curve is 28.9 miles per hour. The approach roads from the Absaroka Heights residential subdivision and the Industrial Park have 30-inch X 30-inch, R1-1, stop sign control. There are also school bus stop signs on each approach. Sight distance from the west approach is limited by the crest of the hill. Brush and trees on the inside of the curve limits sight distance around the curve.

The estimated average daily traffic at this site is 590 vpd on the south leg and 200 vpd on the west leg.

B. Accident Chatacteristics

Two reported accidents have occurred at this location during the five-year period from 1979 through 1983. The 1979 accident occurred at 5:15 AM on a Sunday. Five persons wre injured and one person killed when an eastbound vehicle left the road at high speed on the curve. The vehicle struck the approach of the Industrial Park road. Speed was listed as a possible violoation. The second accident occurred at 6:30

AM on a Saturday in August, 1983. The location and circumstances of the accident were similiar to the 1979 accident. Three persons were injured. Alcohol was a possible violation. The investigating officer called for an engineering study of the site.

Accident diagrams are shown in Figure 5-1. Table 5-1 summarizes accident characteristics at the site.

C. Evaluation

The following factors pertained to the site were determined from the field survey and accident analysis.

1. Accidents occurring at this site are severe and are the result of high speed from the west approach. This indicates the need for improved driver information on the curve approaches and delineation around the curve.

2. The 25 MPH speed limit signs on the west and south approaches are being used in place of 25 MPH speed advisory plates. The speed limit signs should be placed on separate posts and advisory speed plates added to the curve signs.

D. Recommendations

The following improvements are recommended for this site. The improvements are shown on Figure 5-2.

1. Install existing 24-inch X 30-inch, R2-1, 25 MPH speed limit signs on separate posts at beginning and end of 25 MPH speed zone.

2. Install a 24-inch X 30-inch, R2-1, 55 MPH speed limit sign on the north side of the west approach to indicate the end of the 25 MPH speed zone.

3. Replace the existing curve signs with 30-inch X 30-inch, W1-1R and W1-1L, turn signs with 18-inch X 18-inch, W13-1, 25 MPH advisory speed plates.

4. Install six W1-8, 18-inch X 24-inch, double chevron alignment signs on curve, placement to be determined in field.

5. Restripe curve for no passing, 750 feet on either side.

6. Replace damaged stop sign on the approach to Absaroka Heights with a 30-inch X 30-inch, R1-1, stop sign.

E. Cost Estimates

Item	Quantity	Unit	Unit Cost	Total Cost
Install existing 30"X24", 25 MPH speed limit signs on separate posts	1	ea.	$50	$ 100
Install a 30"X24", 55 MPH speed limit sign	1	ea.	$160	$ 160
Replace existing curve signs with 30"X30", W1-1R and W1-1L, turn signs	2	ea.	$180	$ 360
Install 18"X18", W13-1, 25 MPH, advisory speed plates	2	ea.	$35	$ 70
Install W1-8, 18"X24", double chevron alignment signs	6	ea.	$180	$1,080
Restripe curve for no passing	1,500	lin.ft.	20¢	$ 300
Replace damaged sign with 30"X30", R1-1, stop sign	1	ea.	$145	145
			Total cost	$2,215

F. Hazard and Priority Indices

Based on the information collected and the foregoing analysis, the hazard index for this location is determined to be 59.40. The priority index is 68.55. The calculations are shown in Table 5-2.

ACCIDENT SUMMARY

SITE NUMBER 5 ACCIDENT PERIOD 1979 - 1982

NUMBER OF ACCIDENTS BY YEAR

1979	1980	1981	1982-83
1			1

NUMBER OF ACCIDENTS BY DAY OF WEEK

Sun.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.
1						1

NUMBER OF ACCIDENTS BY MONTH

Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
							1		1		

NUMBER OF ACCIDENTS BY TIME OF DAY

-- AM --												-- PM --											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
				1	1																		

NUMBER OF ACCIDENTS BY LIGHT CONDITIONS

Day-light	Dark	Dawn	Dusk
	1	1	

NUMBER OF ACCIDENTS BY ROAD CONDITIONS

Dry	Wet	Snow	Ice	Other
2				

NUMBER OF ACCIDENTS BY WEATHER CONDITIONS

Clear	Rain	Snow	Fog
2			

NUMBER OF ACCIDENTS BY ACCIDENT TYPE

Angle	Turn	Rear End	Fixed Object	Ped.	Animal	Side-swipe	Non-Col	Head-on	Backing
			1				1		

NUMBER OF ACCIDENTS BY POSSIBLE VIOLATION

No Violat.	Drinking	Reckless Driving	Speed	Right-of-Way	Improper Passing	Improper Backing	Improper Turning	Other
	1		1					

NUMBER OF ACCIDENTS BY SEVERITY

	1979	1980	1981	1982-83
Injury				1
Fatality	1			
Property Dam. Only				

NUMBER OF ACCIDENTS ALCOHOL INVOLVED

1

Table 5-2

HAZARD INDEX CALCULATION

Site Number 5 Date January 1984

Site Description Crow Agency -- curve on Indian Service Road 1 at intersection of Industrial Park access road

Indicator	Data Value		Indicator Value		Weight		Partial H.I.'s
Number of Accidents	0.40	acc/yr	13	X	0.164	=	2.13
Accident Rate	2.77	acc/MVE	53	X	0.225	=	11.92
Accident Severity	12,400	dollars	70	X	0.191	=	13.37
Volume/Capacity Ratio	0.09		26	X	0.082	=	2.13
Sight Distance Ratio	0.50	(wt.ave.)	100	X	0.074	=	7.40
Driver Expectancy	5.00	(wt.ave.)	85	X	0.149	=	12.67
Information System Deficiencies	5.00	(wt.ave.)	85	X	0.115	=	9.78

Hazard Index: 59.40

Cost of Recommended Improvements: $2,215

Cost Factor: 96

Priority Index = Hazard Index X .75 + Cost Factor X .25

59.40 X .75 + 96 X .25 = 68.55

LEGEND

—— 610 Average Daily Traffic

Brush & Trees

N

STOP

0615 10/7/79 C D DARK

0630 8/27/83 C D DAWN

R R

STOP

R-410'

Asphalt

200

SCHOOL BUS STOP

ABSAROKA HEIGHTS

SCHOOL BUS STOP

STOP

SPEED LIMIT 25

590

SPEED LIMIT 25

COLLISION TYPES

- Rear End
- Head On
- Side Swipe
- Out of Control
- Left Turn
- Right Angle

SYMBOLS

- Moving Vehicle
- Backing Vehicle
- Pedestrian Path
- Parked Vehicle
- Fixed Object
- Fatal Accident
- Injury Accident

CONDITIONS

WEATHER:
F=Fog C=Clear R=Rain
S=Snow SL=Sleet

SURFACE: D=Dry W=Wet I=Icy

TIME → 1600 7/2/82 ← DATE
WEATHER → C D DARK ← LIGHT
SURFACE

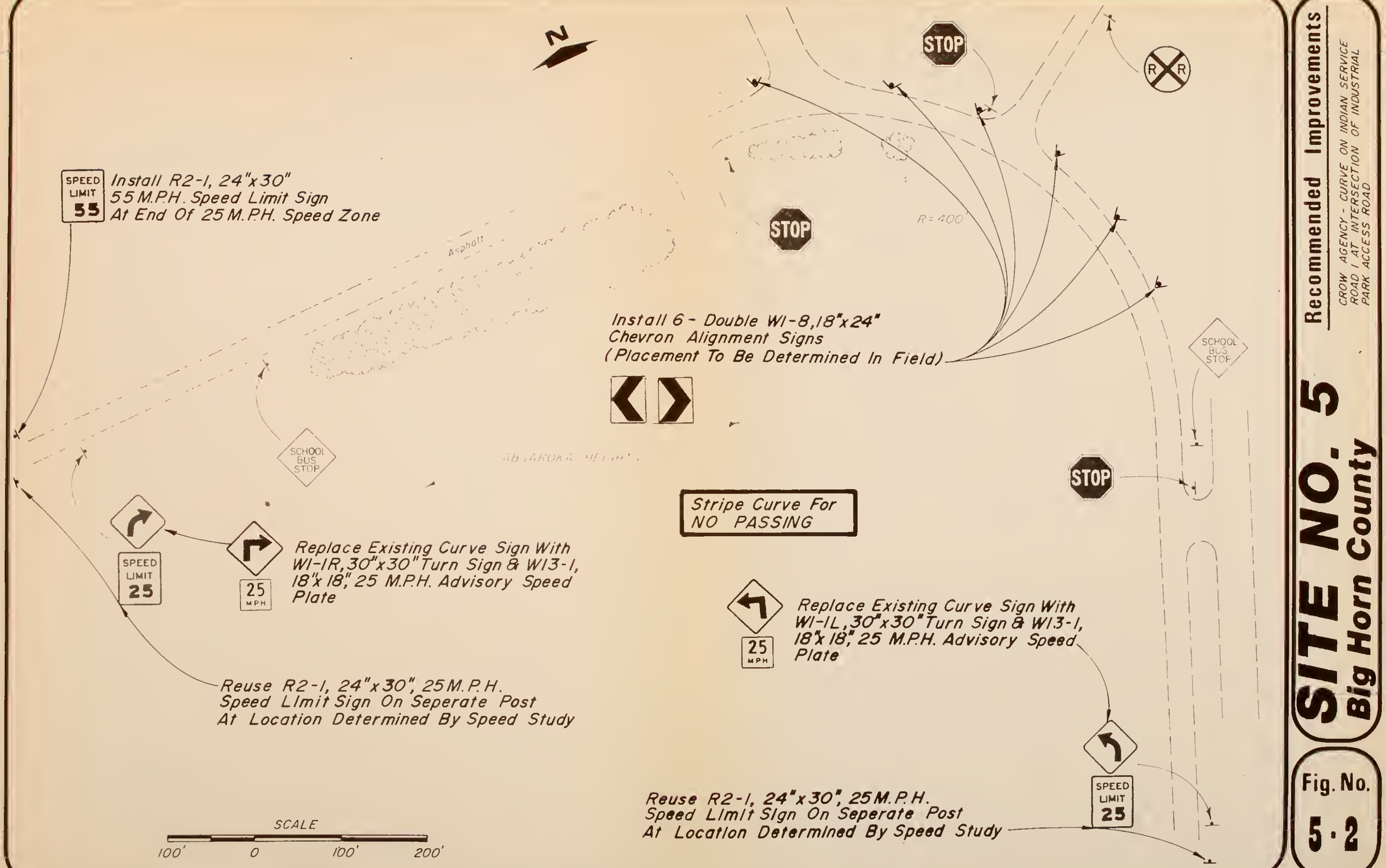
SCALE
100' 0 100' 200'

5 Existing Conditions & Accidents

CROW AGENCY - CURVE ON INDIAN SERVICE ROAD I AT INTERSECTION OF INDUSTRIAL PARK ACCESS ROAD

SITE NO. 5
Big Horn County

Fig. No. 5-1



5 Recommended Improvements

CROW AGENCY - CURVE ON INDIAN SERVICE ROAD I AT INTERSECTION OF INDUSTRIAL PARK ACCESS ROAD

SITE NO.
Big Horn County

Fig. No.
5·2

Site No. 6

SITE NO. 6 - CROW AGENCY



East Approach



South Approach



West Approach



FAR West Approach

SITE #6

CROW AGENCY -- INTERSECTION OF MAKAWASHA AVENUE AND BALA STREET

A. Description

This site is located in the commercial center of the Crow Agency at the intersection of Makawasha Avenue and Bala Street. Makawasha Avenue is a through street with stop signs located on the side street approaches. Parking seems to be at random and probably results in minor, unreported accidents.

Estimated traffic volumes at the intersection are as follows:

Leg	Vehicles per Day
North	700
South	1,500
East	900
West	1,700

Existing conditions are shown on Figure 6-1.

B. Accident Characteristics

Three reported accidents occurred in the vicinity of this site. All occurred in 1982 and 1983. Two of the accidents occurred on weekdays during mid-day hours. All three accidents involved collisions between turning vehicles on side streets. Icy and snowpacked road conditions were contributing factors in two of the accidents. None of the accidents resulted in injuries or fatalities.

Accident diagrams are shown in Figure 6-1. Table 6-1 summarizes accident characteristics at the site.

C. Evaluation

The following factors pertaining to the site were determfined from the field survey and accident analysis:

1. Reported accidents involved multi-vehicle collisions due to turning movements.

2. The field survey determined that the present parking on Makawasha Avenue is random which contributes to poor visibility when parking and unparking.

D. Recommendations

The following improvements are recommended for this site. The improvements are shown on Figure 6-2.

1. Replace stop sign on south leg of intersection with a 30-inch X 30-inch, R1-1 stop sign.

2. Eliminate parking at the intersection for 20 feet on all legs by painting curb.

3. Designate parking spaces by striping Makawasha Avenue for 60-degree angle parking on the south side and parallel parking on the north side. Stripe Bala Street for parallel parking on both sides.

E. Cost Estimates

Item	Quantity	Unit	Unit Cost	Total Cost
Install 30"X30", R1-1, stop sign on south approach	1	ea.	$180	$180
Paint curbs at intersection	200	lin.ft.	50¢	$100
Paint parking stalls	1,500	lin.ft.	20¢	300
			Total cost	$580

F. Hazard and Priority Indices

Based on the information collected and the foregoing analysis, the hazard index for this location is determined to be 37.74. The priority index is 53.30. The calculations are shown in Table 6-2.

Table 6-1

ACCIDENT SUMMARY

SITE NUMBER 6 ACCIDENT PERIOD 1979 - 1982

NUMBER OF ACCIDENTS BY YEAR

1979	1980	1981	1982-83
			3

NUMBER OF ACCIDENTS BY DAY OF WEEK

Sun.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.
	1				1	1

NUMBER OF ACCIDENTS BY MONTH

Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1				1						1	

NUMBER OF ACCIDENTS BY TIME OF DAY

-- AM --

1	2	3	4	5	6	7	8	9	10	11	12
			1								1

-- PM --

13	14	15	16	17	18	19	20	21	22	23	24
1											

NUMBER OF ACCIDENTS BY LIGHT CONDITIONS

Day-light	Dark	Dawn	Dusk
2	1		

NUMBER OF ACCIDENTS BY ROAD CONDITIONS

Dry	Wet	Snow	Ice	Other
1		1	1	

NUMBER OF ACCIDENTS BY WEATHER CONDITIONS

Clear	Rain	Snow	Fog
3			

NUMBER OF ACCIDENTS BY ACCIDENT TYPE

Angle	Turn	Rear End	Fixed Object	Ped.	Animal	Side-swipe	Non-Col	Head-on	Backing
	3								

NUMBER OF ACCIDENTS BY POSSIBLE VIOLATION

No Violat.	Drinking	Reckless Driving	Speed	Right-of-Way	Improper Passing	Improper Backing	Improper Turning	Other
3								

NUMBER OF ACCIDENTS BY SEVERITY

	1979	1980	1981	1982-83
Injury				
Fatality				
Property Dam. Only				3

NUMBER OF ACCIDENTS ALCOHOL INVOLVED

0

Table 6-2

HAZARD INDEX CALCULATION

Site Number 6 Date January 1984

Site Description Crow Agency -- intersection of Makowasha Avenue and Bala Street

Indicator	Data Value		Indicator Value		Weight		Partial H.I.'s
Number of Accidents	0.60	acc/yr	16	X	0.164	=	2.62
Accident Rate	1.37	acc/MVE	28	X	0.225	=	6.30
Accident Severity	3,700	dollars	35	X	0.191	=	6.68
Volume/Capacity Ratio	0.36		53	X	0.082	=	4.35
Sight Distance Ratio	1.00	(wt.ave.)	32	X	0.074	=	2.37
Driver Expectancy	3.00	(wt.ave.)	51	X	0.149	=	7.60
Information System Deficiencies	4.00	(wt.ave.)	68	X	0.115	=	7.82

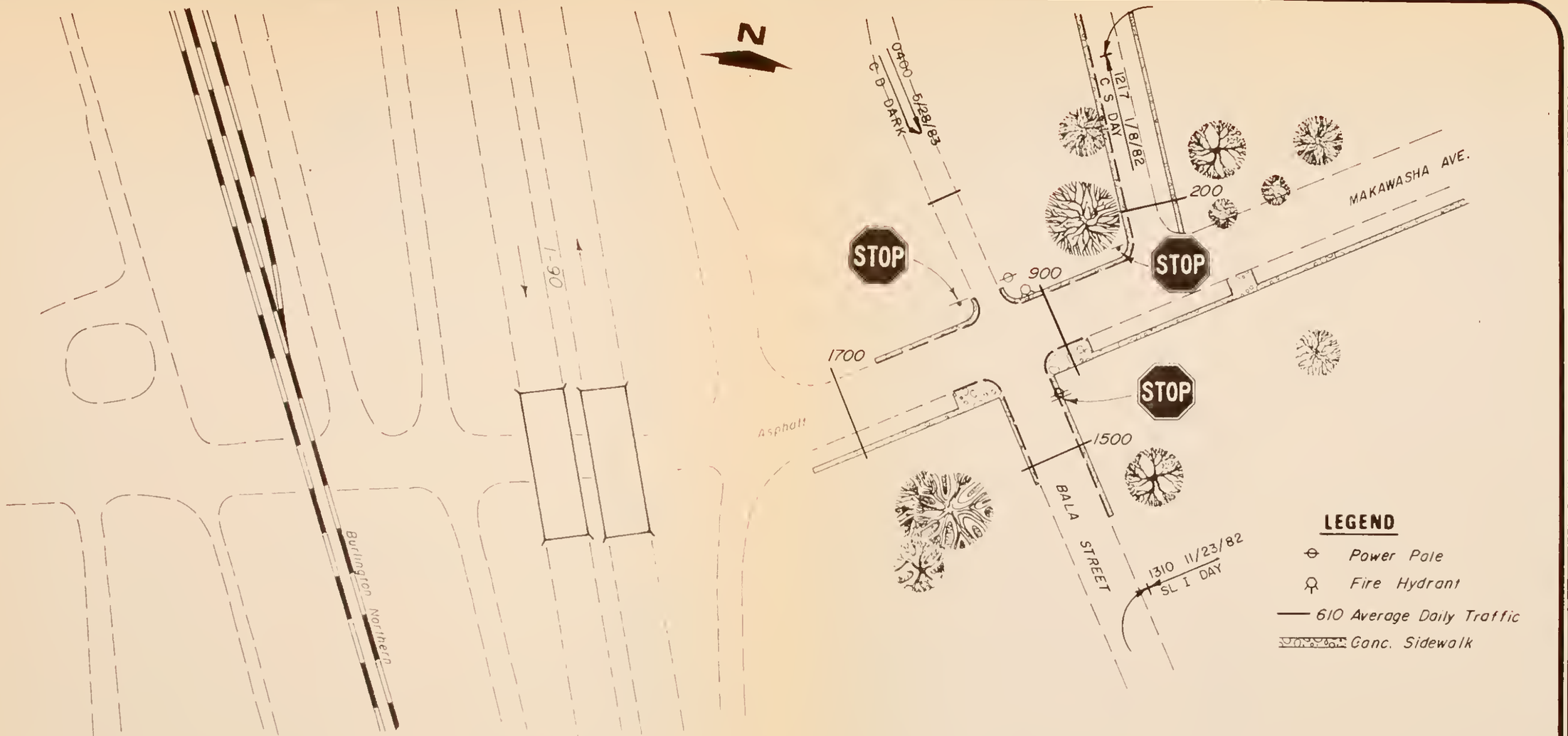
Hazard Index: 37.74

Cost of Recommended Improvements: $580

Cost Factor: 100

Priority Index = Hazard Index X .75 + Cost Factor X .25

37.74 X .75 + 100 X .25 = 53.30



COLLISION TYPES

- Rear End
- Head On
- Side Swipe
- Out of Control
- Left Turn
- Right Angle

SYMBOLS

- Moving Vehicle
- Backing Vehicle
- Pedestrian Path
- Parked Vehicle
- Fixed Object
- Fatal Accident
- Injury Accident

CONDITIONS

WEATHER:
F=Fog C=Clear R=Rain
S=Snow SL=Sleet

SURFACE: D=Dry W=Wet I=Icy

TIME → 1600 7/2/82 ← DATE
WEATHER → C D DARK ← LIGHT
SURFACE

SCALE
100' 0 100' 200'

Existing Conditions & Accidents

CROW AGENCY

SITE NO. 6
Big Horn County

Fig. No.
6-1

6 Recommended Improvements

CROW AGENCY

N

Designate Parking Stalls

STOP

STOP

STOP

MAKAWASHA AVE.

Designate Parking Stalls

Replace With 30"x 30" R1-1 Stop Sign

Designate Parking Stalls

BALA STREET

Designate NO PARKING (Curb Marking)

A. phalt

10'

18'

20'

24'

24'

SCALE

100' 0 100' 200'

SITE NO. 6

Big Horn County

Fig. No.

6-2

Site No. 7

SITE NO. 7 - EAST FRONTAGE ROAD - NORTH OF MONTANA HIGHWAY 212 AT SUN LODGE MOTEL



North Approach



FAR North Approach



Southeast Approach

SITE #7
EAST FRONTAGE ROAD -- NORTH OF MONTANA 212 AT SUN LODGE MOTEL

A. Description

This site is located in the vicinity of the driveway approach to the Sun Lodge Motel, south of Crow Agency. The site is a curve on the north approach to Montana Highway 212. The road is 24 to 26 feet wide with a paved surface. Traffic control consists of a W1-4, reverse curve sign on the north approach to Montana Highway 212 and 30-inch X 30-inch stop signs on the driveway approaches to the Sun Lodge Motel and other tribal offices. The north approach to Montana Highway 212 is striped for no passing in either direction.

The estimated average daily traffic is 900 vpd.

Existing conditions are shown on Figure 7-1.

B. Accident Characteristics

Three reported accidents occurred at this location during the four-year period from 1979 through 1982. All occurred during the week and during fall or winter months. The accidents occurred between the hours of 12:00 noon and 8:00 PM. Road condition was dry during two of the accidents and icy during one. All three accidents involved southbound vehicles attempting to turn at the driveway approaches. Two involved vehicles passing turning vehicles and one involved a rearend collision with a vehicle which had stopped to turn.

Accident diagrams are shown in Figure 7-1. Table 7-1 summarizes accident characteristics at the site.

C. Evaluation

The following factors pertaining to the site were determined from the field survey and accident analysis:

1. The major cause of reported accidents at this location is collisions between southbound through traffic and turning vehicles.

2. Traffic volumes do not justify the construction of left turn bays at this time.

D. Recommendations

The following improvements are recommended for this site. The improvements are shown in Figure 7-2.

1. Extend existing no passing striping from north approach to Montana Highway 212 to 750 feet north of the driveway approach.

2. Install three 36-inch X 48-inch X 48-inch, W14-3, no passing zone signs on the east shoulder of the Frontage Road, spaced at 200 feet and extending north from the driveway approach.

E. Cost Estimates

Item	Quantity	Unit	Unit Cost	Total Cost
Install 36"X48"X48", W14-3, no passing zone signs	3	ea.	$180	$540
Extend no passing striping north	1,800	lin.ft.	20¢	$360
			Total cost	$900

F. Hazard and Priority Indices

Based on the information collected and the foregoing analysis, the hazard index for this location is determined to be 42.88. The priority index is 56.91. The calculations are shown in Table 7-2.

Table 7-1

ACCIDENT SUMMARY

SITE NUMBER 7 ACCIDENT PERIOD 1979 - 1982

NUMBER OF ACCIDENTS BY YEAR

1979	1980	1981	1982
		1	2

NUMBER OF ACCIDENTS BY DAY OF WEEK

Sun.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.
	1			1	1	

NUMBER OF ACCIDENTS BY MONTH

Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1									1		1

NUMBER OF ACCIDENTS BY TIME OF DAY

-- AM --																							-- PM --
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
											1				1			1					

NUMBER OF ACCIDENTS BY LIGHT CONDITIONS

Day-light	Dark	Dawn	Dusk
2	1		

NUMBER OF ACCIDENTS BY ROAD CONDITIONS

Dry	Wet	Snow	Ice	Other
2			1	

NUMBER OF ACCIDENTS BY WEATHER CONDITIONS

Clear	Rain	Snow	Fog
2	1		

NUMBER OF ACCIDENTS BY ACCIDENT TYPE

Angle	Turn	Rear End	Fixed Object	Ped.	Animal	Side-swipe	Non-Col	Head-on	Backing
	1	1				1			

NUMBER OF ACCIDENTS BY POSSIBLE VIOLATION

No Violat.	Drinking	Reckless Driving	Speed	Right-of-Way	Improper Passing	Improper Backing	Improper Turning	Other
			1		2			

NUMBER OF ACCIDENTS BY SEVERITY

	1979	1980	1981	1982
Injury				
Fatality				
Property Dam. Only			1	2

NUMBER OF ACCIDENTS ALCOHOL INVOLVED

0

Table 7-2

HAZARD INDEX CALCULATION

Site Number 7 Date January 1984

Site Description East Frontage Road -- north of Montana Highway 212 at Sun Lodge Motel

Indicator	Data Value		Indicator Value		Weight		Partial H.I.'s
Number of Accidents	0.75	acc/yr	17	X	0.164	=	2.79
Accident Rate	2.28	acc/MVE	45	X	0.225	=	10.12
Accident Severity	5,167	dollars	48	X	0.191	=	9.17
Volume/Capacity Ratio	0.13		30	X	0.082	=	2.46
Sight Distance Ratio	0.75	(wt.ave.)	66	X	0.074	=	4.88
Driver Expectancy	3.00	(wt.ave.)	51	X	0.149	=	7.60
Information System Deficiencies	3.00	(wt.ave.)	51	X	0.115	=	5.86

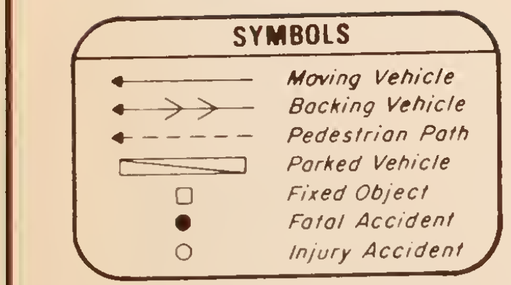
Hazard Index: 42.88

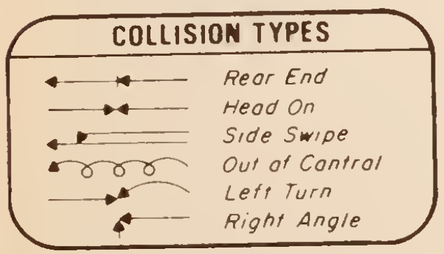
Cost of Recommended Improvements: $900

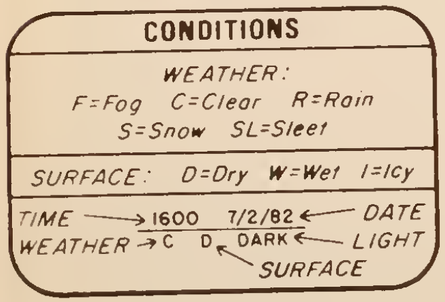
Cost Factor: 99

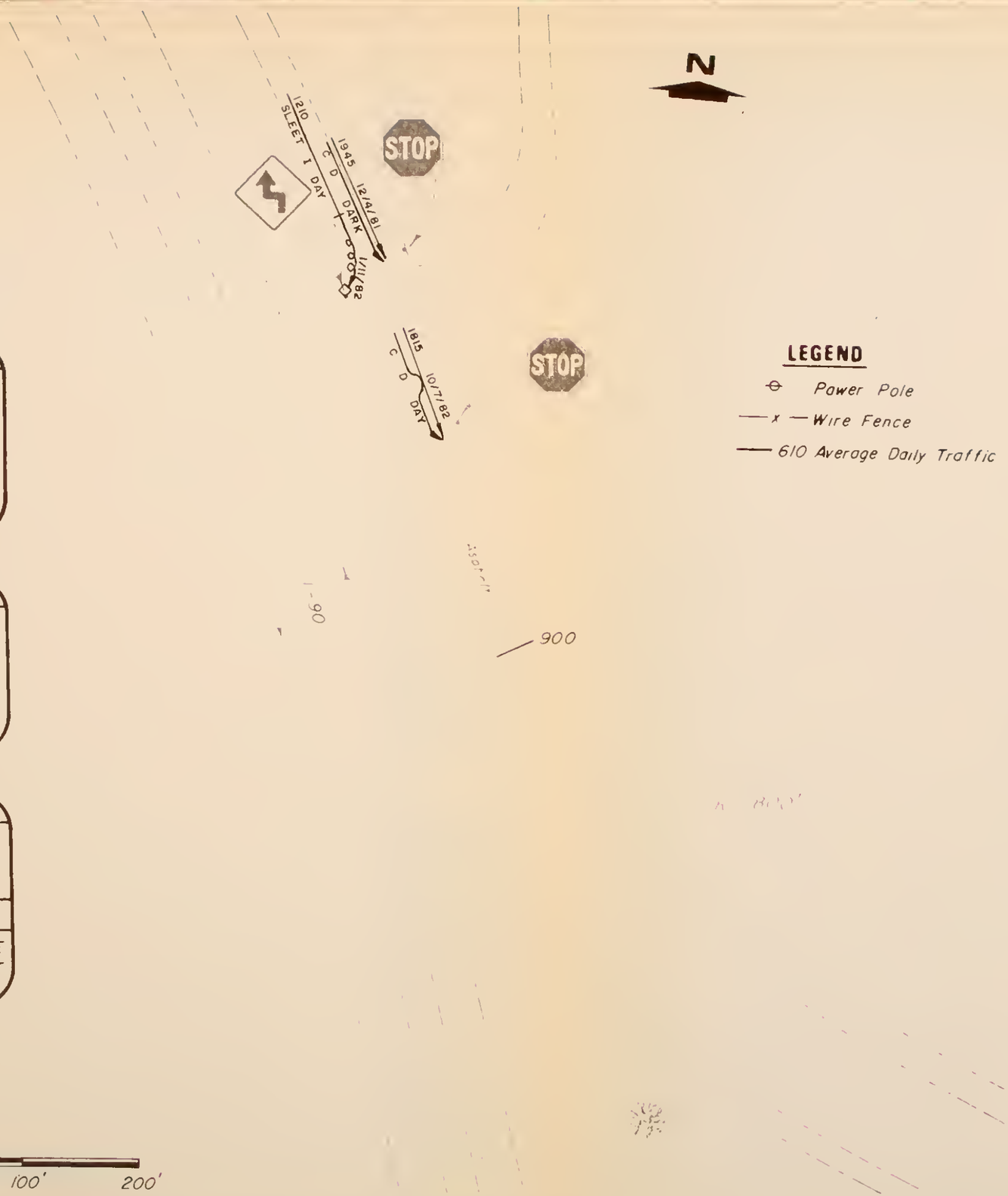
Priority Index = Hazard Index X .75 + Cost Factor X .25

42.88 X .75 + 99 X .25 = 56.91









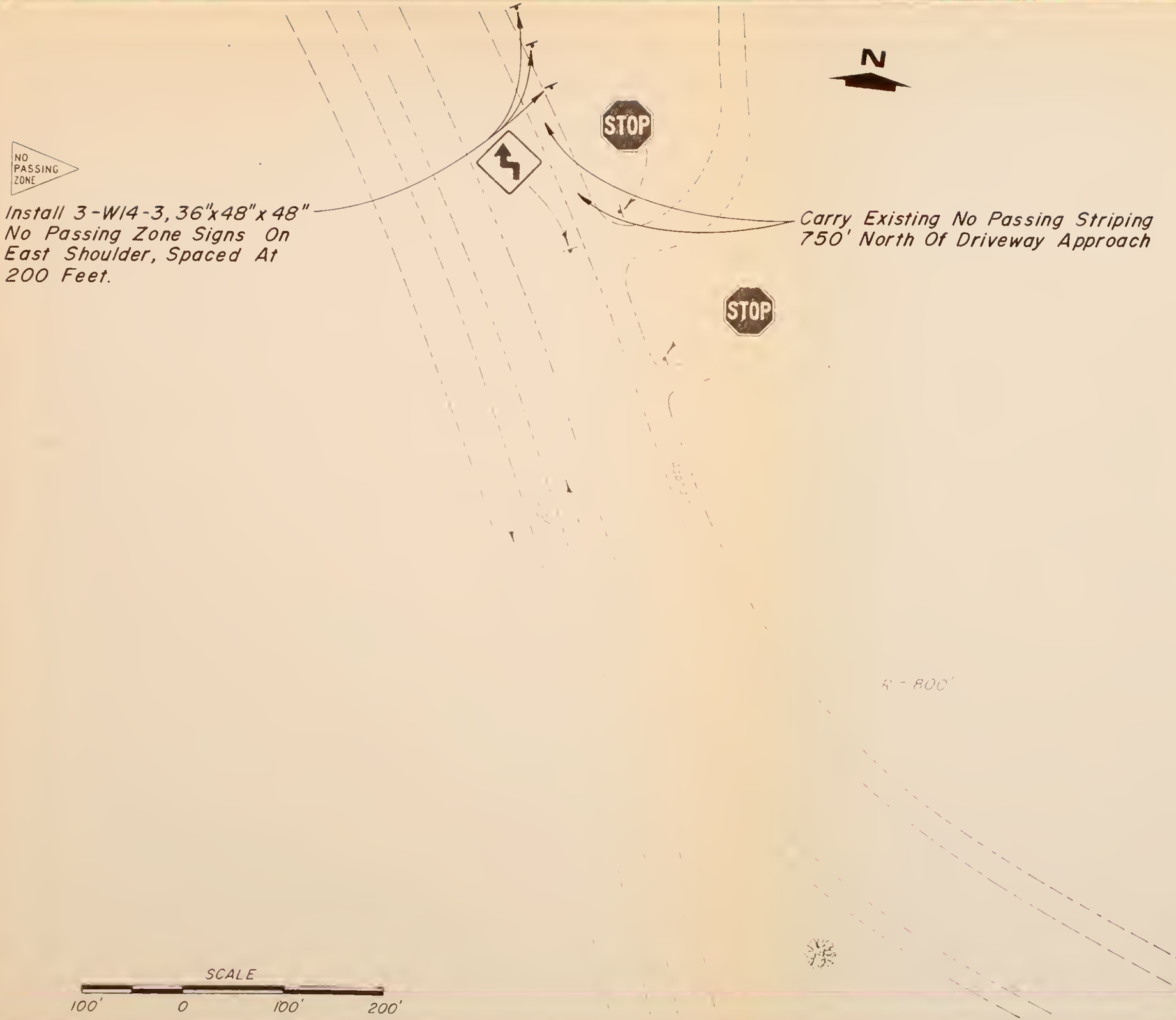


7 Existing Conditions & Accidents

EAST FRONTAGE ROAD - NORTH OF
MONTANA HIGHWAY 212 AT SUN LODGE MOTEL

SITE NO. 7
Big Horn County

Fig. No.
7-1



SITE NO. 7

Big Horn County

Recommended Improvements

EAST FRONTAGE ROAD - NORTH OF MONTANA HIGHWAY 212 AT SUN LODGE MOTEL

Fig. No. 7-2

Site No. 8

SITE NO. 8 - INTERSECTION OF MONTANA HIGHWAY 212 AND FRONTAGE ROAD AT LITTLE HORN CAMP & TRAILER PARK



North Approach



East Approach



South Approach

SITE #8

INTERSECTION OF MONTANA HIGHWAY 212 AND
WEST FRONTAGE ROAD NEAR LITTLE HORN CAMP AND TRAILER PARK

A. Description

This site is located at the intersection of Montana Highway 212 and the west frontage road near the Little Horn Camp and Trailer Park. The site is a "T" intersection. Traffic control consists of a 36-inch X 36-inch, stop sign on the north approach of the frontage road; a 48-inch X 48-inch, stop sign on the Interstate 90 off-ramp; and a 48-inch X 48-inch, stop sign on the south leg of the frontage road. The west leg of the intersection is a gravel road that crosses the Burlington Northern Railroad track. This road appears to be a private access and at the time of the field survey, showed little sign of use.

The estimated average daily traffic volumes at the intersection are 10 vpd on the north leg, 200 vpd on the south leg, and 400 vpd on the east leg.

Existing conditions are shown on Figure 8-1.

B. Accident Characteristics

Six reported accidents occurred at this site during the four-year period from 1979 through 1982. Five of the accidents occurred in 1981 and one in 1982. Three of the accidents were on a Monday and three on a Friday. There is no apparent seasonal pattern to the accidents. Four accidents occurred from 4:00 AM to 8:00 AM and two occurred around 8:00 PM in the evening. Five of the six accidents occurred during hours of darkness.

The road conditions were dry and weather clear during all of the accidents. Five of the accidents were attributed to speed or loss of control. There was one accident involving injuries.

Accident diagrams are shown in Figure 8-1. Table 8-1 summarizes accident characteristics at the site.

C. Evaluation

The following factors pertaining to the site were determined from the field survey and accident analysis:

1. Conversation with the owner of the Little Horn Camp and Trailer Park during the field survey indicated that there have been a number of unreported accidents involving out-of-control westbound vehicles crossing through the intersection and into the private property.

2. Three of the reported accidents involved westbound vehicles running through the intersection.

D. Recommendations

The following improvements are recommended for this site. The improvements are shown in Figure 8-2.

1. Install a 30-inch X 30-inch, W2-4 "T" symbol sign on the east approach.

2. Install a 36-inch X 36-inch, W3-1, stop ahead sign on the east approach.

3. Install a 48-inch X 48-inch, R1-1, stop sign on the east approach.

4. Install a 48-inch X 24-inch, W1-7, large double arrows sign on the west side of the intersection.

5. Raise the existing 48-inch X 48-inch, R1-1 stop sign on the south approach to standard height (minimum of five feet above roadway).

E. Cost Estimates

Item	Quantity	Unit	Unit Cost	Total Cost
Install 30"X30", W2-4, "T" symbol sign	1	ea.	$180	$180
Install 36"X36", W3-1, stop ahead sign	1	ea.	$225	$225
Install 48"X48", R1-1, stop sign	1	ea.	$300	$300
Install 48"X24", W1-7, large double arrow sign	1	ea.	$210	$210
Raise existing stop sign	1	ea.	$50	$ 50
			Total cost	$965

F. Hazard and Priority Indices

Based on the information collected and the foregoing analysis, the hazard index for this location is determined to be 65.86. The priority index is 73.40. The calculations are shown in Table 8-2.

Table 8-1

ACCIDENT SUMMARY

SITE NUMBER 8 ACCIDENT PERIOD 1979 - 1982

NUMBER OF ACCIDENTS BY YEAR

1979	1980	1981	1982
		5	1

NUMBER OF ACCIDENTS BY DAY OF WEEK

Sun.	Mon.	Tues.	Wed.	Thurs.	Fri.	Sat.
	3				3	

NUMBER OF ACCIDENTS BY MONTH

Jan.	Feb.	March	April	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
1			1			1	1		1	1	

NUMBER OF ACCIDENTS BY TIME OF DAY

-- AM --												-- PM --											
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
			2		1		1												2				

NUMBER OF ACCIDENTS BY LIGHT CONDITIONS

Day-light	Dark	Dawn	Dusk
1	5		

NUMBER OF ACCIDENTS BY ROAD CONDITIONS

Dry	Wet	Snow	Ice	Other
6				

NUMBER OF ACCIDENTS BY WEATHER CONDITIONS

Clear	Rain	Snow	Fog
6			

NUMBER OF ACCIDENTS BY ACCIDENT TYPE

Angle	Turn	Rear End	Fixed Object	Ped.	Animal	Side-swipe	Non-Col	Head-on	Backing
			3				2		1

NUMBER OF ACCIDENTS BY POSSIBLE VIOLATION

No Violat.	Drinking	Reckless Driving	Speed	Right-of-Way	Improper Passing	Improper Backing	Improper Turning	Other
			2			1		3

NUMBER OF ACCIDENTS BY SEVERITY

	1979	1980	1981	1982
Injury			1	
Fatality				
Property Dam. Only			4	1

NUMBER OF ACCIDENTS ALCOHOL INVOLVED

0

Table 8-2

HAZARD INDEX CALCULATION

Site Number 8 Date January 1984

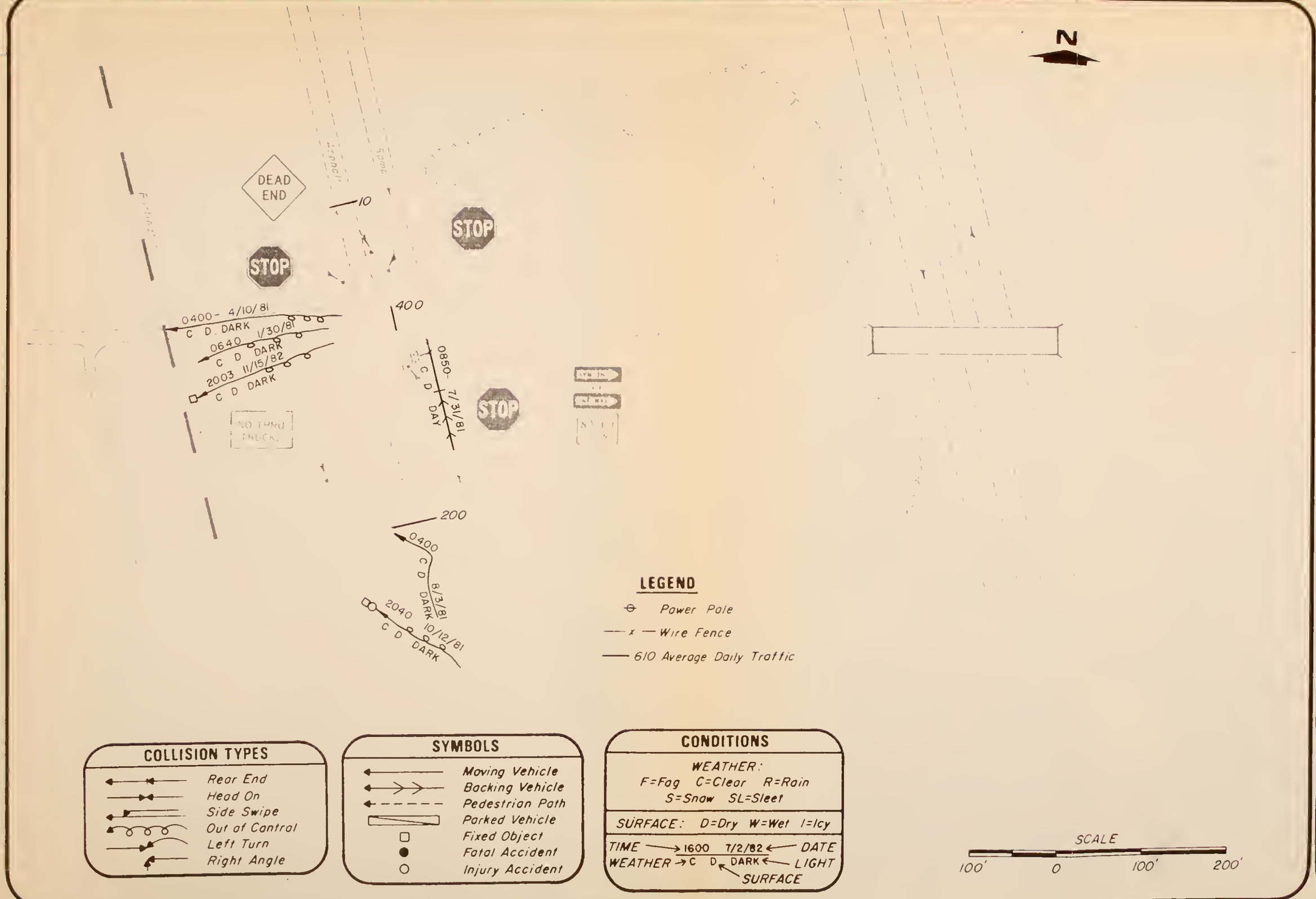
Site Description Intersection of Montana Highway 212 and Frontage Road at Little Horn Camp and Trailer Park

Indicator	Data Value		Indicator Value		Weight		Partial H.I.'s
Number of Accidents	1.20	acc/yr	27	X	0.164	=	4.43
Accident Rate	6.70	acc/MVE	98	X	0.225	=	22.05
Accident Severity	11,417	dollars	67	X	0.191	=	12.80
Volume/Capacity Ratio	0.04		15	X	0.082	=	1.23
Sight Distance Ratio	0.50	(wt.ave.)	100	X	0.074	=	7.40
Driver Expectancy	4.00	(wt.ave.)	68	X	0.149	=	10.13
Information System Deficiencies	4.00	(wt.ave.)	68	X	0.115	=	7.82

Hazard Index:	65.86
Cost of Recommended Improvements:	$965
Cost Factor:	96

Priority Index = Hazard Index X .75 + Cost Factor X .25

65.86 X .75 + 96 X .25 = 73.40



Existing Conditions & Accidents

INTERSECTION OF MONTANA HIGHWAY 212
AND FRONTAGE ROAD AT LITTLE HORN
CAMP & TRAILER PARK

SITE NO. 8
Big Horn County

Fig. No.
8-1



Recommended Improvements

INTERSECTION OF MONTANA HIGHWAY 212
AND FRONTAGE ROAD AT LITTLE HORN
CAMP & TRAILER PARK

SITE NO. 8
Big Horn County

Fig. No. 8-2